Sets coplete

NMAH 310/1

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DPSD:LLG:kw
5 May 1961

MEMORANDUM FOR FILE

From: L. L. Griffin - member ASA X3-2 subcommittee

Subj: Status of ASA X3-2 subcommittee - 3 May 1961

Encl: (1) Sketch of Code sets

1. Under the American Standards Association X3 Regional Committee, the task of the X3-2 subcommittee is to develop recommendations for a coded character set and recording formats for interchange of information between automatic data processing systems and between systems and associated equipment.

2. The subcommittee membership is predominately from manufacturing activities (IBM, REMRAND, BURROUGHS, etc.), with some communication industry and Government representation. Eight meetings have been held to date, most of them two-day sessions. Information on existing codes and their applications have been available to the subcommittee membership. Information exchanges have taken place between members of X3-2 and Department of Defense representatives with respect to the military eight bit data transmission code (Fieldata) as a basis for a standard coded character set. In subcommittee meeting, a great deal of discussion has been devoted to trying to reconcile the character arrangements in the Fieldata code with the arrangement preferred by computer manufacturers. The major differences are described in general terms in following paragraphs.

3. The computer industry representatives' most fundamental objection to the character arrangement in the DOD Fieldata code is that the special characters (punctuation symbols) are placed higher in the code structure than the alphabetic characters. The automatic data processing industry wishes to establish a standard collating sequence (order of information in files, tape rolls, etc.), as well as a standard for coding of characters, symbols, etc. The ordering of information, such as name files, part number lists which include hyphen, slash or special characters in addition to numbers in an ascending order, comes about more naturally when word or group ending or separating symbols collate lower than numerals or alphabetic characters. The special symbols except for "space" are, in general, higher than the alphabet but lower than numerals in the Fieldata code. Enclosure (1) shows the arrangement of the 64 standard characters, symbols and functions of the Fieldata code as well as the six bit code

equivalents in certain other commonly used data processing equipment. Most of these codes require examination of a character code by a computer in more detail than is desirable before a determination can be made of the action to be taken, particularly in sorting and collating operations. Also such action must often be controlled by program steps. The computer equipment designers believe that a coded character set can be developed which has a natural order which will minimize the need for program steps to perform sort-merger type operations. The benefits expected from such a coded character set are minimum hardware costs, as well as more effective operation through fewer program steps to perform sort-merge functions.

4. A second point of objection on the part of ADP manufacturer's representatives to the Fieldata code arrangement, relates to the relative difficulty of expansion into a larger character set. The designs would prefer to have the like functions of a code set to be grouped together. All of the control characters in one or more contiguous blocks or sections, all specials in another area and alphabetic in another, etc. These representatives propose character arrangements which simplify the logic required to maintain such like character grouping in 4, 6, 7 and 8 bit coded character sets, in those cases where it becomes necessary to expand or collapse such sets for inter-communication purposes.

5. The progress of the X3-2 subcommittee is not such that a detailed character set can be defined at this time. It seems probable, however, that a Fieldata like set will emerge. The differences being in the positioning of individual characters in the set, and the use made of the 64 combinations designed as "control" in the "Fieldata" set.

6. The attached sketch indicates the major difference in the character set arrangement by quadrant grouping in "Fieldata" and the presently favored X3-2 subcommittee position. Figure 1 indicates the general quadrature arrangement of the DOD "Fieldata" set; Figure 2 the current X3-2 arrangement of a six bit set. Figure 3 indicates a possible expanded arrangement to a 7 bit code, which is currently under consideration. The quadrative arrangement in an 8 bit, 256 combination set, are under consideration, but not in enough detail to show at this time.

L. L. Griffin

L. L. GRIFFIN

Character Set Arrangements
By 16 character blocks (Quadrants)

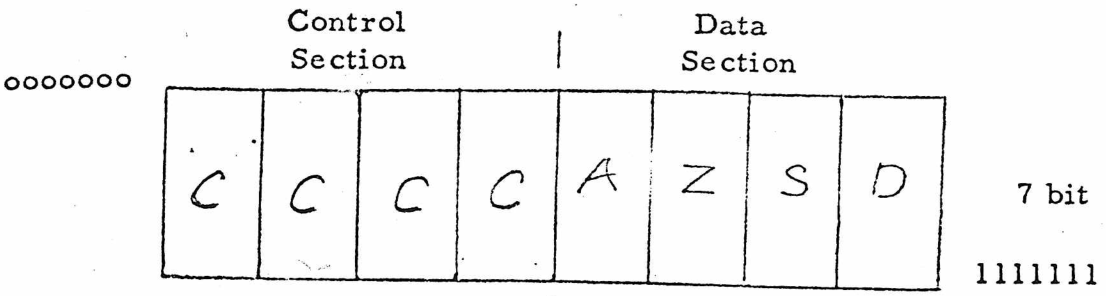


Figure 1

Fieldata

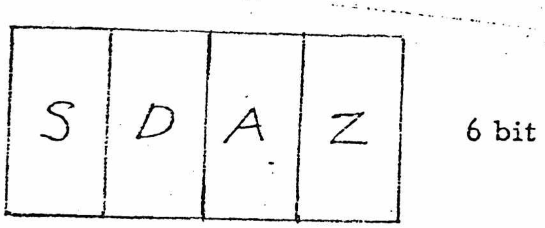


Figure 2

Current X3-2 Arrangement of 64 character set

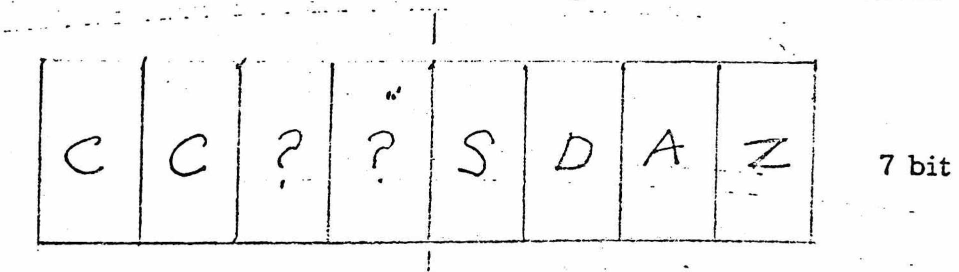


Figure 3

Current proposed expansion of 64 character set to 128 character set

Enclosure (1)

MILITARY STANDARD 8 LEVEL CODE		OCTAL CODE	IBM 705 CDC 1604 NCR 304 FRIDEN	RCA 501	UNIVAC	HONEYWELL 800	PHILCO 2000
DATA CODE 76 54 3210	DATA CHARACTER						
01 00 0000	MS	00	SM		i	0	0
11 00 0001	UC	01	1	—	Δ	1	1
11 00 0010	LC	02	2		-	2	2
01 00 0011	LF	03	3	(	0	3	3
11 00 0100	CR	04	4	)	1	4	4
01 00 0101	SP	05	5	"	2	5	5
01 00 0110	A	06	6	:	3	6	6
11 00 0111	B	07	7	$	4	7	7
11 00 1000	C	10	8	%	5	8	8
01 00 1001	D	11	9	;	6	9	9
01 00 1010	E	12	0		7	'	@
11 00 1011	F	13	#	'	8	,	=
01 00 1100	G	14	@	-	9	@	;
11 00 1101	H	15		*	'	&	≡
11 00 1110	I	16		.	%	.	&
01 00 1111	J	17	TM	cs	(	+	'
11 01 0000	K	20		pc	r		+
01 01 0001	L	21	/	ls	,	A	A
01 01 0010	M	22	S	/	.	B	B
11 01 0011	N	23	T	0	;	C	C
01 01 0100	O	24	U	1	A	D	D
11 01 0101	P	25	V	2	B	E	E
11 01 0110	Q	26	W	3	C	F	F
01 01 0111	R	27	X	4	D	G	G
01 01 1000	S	30	Y	5	E	H	H
11 01 1001	T	31	Z	6	F	I	I
11 01 1010	U	32		7	G	cr	n
01 01 1011	V	33	,	8	H	#	.
11 01 1100	W	34	%	9	I		)
01 01 1101	X	35		,	#	(	%
01 01 1110	Y	36		#	¢	)	?
11 01 1111	Z	37	cm	cn	@		"
11 10 0000	)	40	-	A	t	+	-
01 10 0001	-	41	J	B	"	J	J
01 10 0010	+	42	K	C		K	K
11 10 0011	<	43	L	D	)	L	L
01 10 0100	=	44	M	E	J	M	M
11 10 0101	>	45	N	F	K	N	N
11 10 0110	—	46	O	G	L	O	O
01 10 0111	$	47	P	H	M	P	P
01 10 1000	*	50	Q	I	N	Q	Q
11 10 1001	(	51	R	J	O	R	R
11 10 1010	"	52	0	K	P	=	
01 10 1011	:	53	$	L	Q	$	$
11 10 1100	?	54	*	M	R	*	*
01 10 1101	!	55		N	$	¢	
01 10 1110	,	56		O	*	.	#
11 10 1111	STOP	57		P	?		
01 11 0000	0	60	&	Q	Σ		Δ
11 11 0001	1	61	A	R		/	/
11 11 0010	2	62	B	S	:	S	S
01 11 0011	3	63	C	T	+	T	T
11 11 0100	4	64	D	U	/	U	U
01 11 0101	5	65	E	V	S	V	V
01 11 0110	6	66	F	W	T	W	W
11 11 0111	7	67	G	X	U	X	X
11 11 1000	8	70	H	Y	V	Y	Y
01 11 1001	9	71	I	Z	W	Z	Z
01 11 1010	'	72		ef	X	:	STOP
11 11 1011	;	73	.	ed	Y	;	,
01 11 1100	/	74			Z	%	(
11 11 1101	.	75		>	%	½	>
11 11 1110	SP	76		<	=		:
01 11 1111	IDLE	77		DEL	δ		e

Prepared by:
Wallace E. Velander
Navy Management Office

ENCLOSURE (2)

May 5, 1961

Memorandum for Mr. Howard J. Smith, Jr.

Subject: FSD Presentation - Rockville
May 3, 1961

I talked to a group of FSD people in Rockville on May 3 that was organized by Mr. Batley. The following people were in attendance:

V. Adams	Communication Center
J. V. Batley	Systems Center
M. A. Belsky	Systems Center
F. E. Bryant	FSD Owego
R. W. Higgins	Marketing
R. C. Marden	Communication Center
R. R. Martin	Product Planning
T. C. Odom	Long Range Planning
L. H. Warren	Standards Engineering
B. G. Oldfield	Systems Development

Mr. T. C. Odom is a former general who is somewhat aware of the Fieldata problem. He feels that it will be very difficult to get them to make any substantial change as there is no specific party to talk to on this subject. It is spread through many organizations of the government.

Mr. B. G. Oldfield attended who is the FSD representative on the Systems Standards Committee. I requested that they give me the dollar cost of changing from Fieldata code to another code with the same number of bits. Please follow Jim Batley on this.

The problem of programming was suggested by Mr. Belsky, and we were referred to Mr. J. Graham or Mr. R. Sisson to get us some information on the impact of a code change to programming.

We must investigate the possibility of including the Fieldata code in our set with a minimum of logical transformation.

I. C. Liggett

ICL:vmg

NMAH 710/1

X3-2 Sub-Committee
on
Character Sets & Data Formats
of the
American Standards Association
X3 Sectional Committee
Sponsored by
O.E.M.I.

May 31, 1961

NMAH 310/1

MINUTES

~~#8~~ INFORMAL MEETING OF MAY 8th AND 11th

7½

1. MEMBERSHIP & ATTENDANCE

1.1 Members Present

John Auwaerter - Teletype Corp.

Leon Bloom - NCR

T. H. Bonn - Remington Rand

L. L. Griffin - Navy Department

I. C. Liggett - IBM

C. E. Macon - Burroughs Corporation

H. J. Smith, Jr. - IBM

H. Tholstrup - Friden Inc.

Allen L. Whitman - Bell Telephone Lab.

1.2 Members Absent

Robert Gryb - AT&T Company

H. Kleinberg - RCA

Capt. W. J. Leubbert - West Point

Roy W. Reach - Minneapolis Honeywell

Lawrence J. Schoenberg - Monroe Calculating Machine

1.3 Observers Present

W. H. Hill - Director, Data Processing Group - Navy Dept.

S. Porter - (alternate for T.H. Bonn - Remington Rand)

2. DOCUMENTS DISTRIBUTED

2.1 Draft - Minutes of the April 26th and 27th meeting.

2.2 Draft - Basic Criteria for a Standard Family of Coded Character Sets.

2.3 Some Notes on Communication Systems - by C.E. Macon.

2.4 Some Points for Consideration in Determining Standard Coded Character Sets - by C.E. Macon

2.5 64 Character Control Set - by H.J. Smith.

2.6 32 Control Transmission Set - by H.J. Smith.

3. REVIEW OF DRAFT DOCUMENTS

The draft documents (2.1 and 2.2 above) were reviewed and corrected. The corrected version will be issued prior to the next meeting.

4. COMMUNICATION SYSTEMS

Document 2.3 above was reviewed and discussed. It was determined that an expanded version of the document is required both as a basic reference and as a section of the proposal of the standard. Mr. Auwaerter, in collaboration with Mr. Whitman and Mr. Griffin, will prepare an expanded report for the next meeting. The original report plus notes made during the discussion are attached for reference.

5. SOME POINTS FOR CONSIDERATION IN DETERMINING STANDARD CODED CHARACTER SETS

This document was reviewed and corrected. The corrected version is attached.

6. NOTES ON THE GENERAL DISCUSSION

6.1 The discussion covered three basic areas: Set families and inter set translation; set content; and comparison with Fieldata.

6.2 Set families and inter set translation

The philosophy of a family of sets including the range from 4 level through 8 level was again examined and found to be sound. The 7 level set was identified as the prime set for information interchange and communication.

After some study two organizations of the 7 level set seemed most promising. The first would locate the 64 control codes and "non printing" specials in the lower half of the set and the 64 "printing" graphics in the high half of the set. This scheme has the advantage of identifying the two basic sections by the high order bit. It has the disadvantage of requiring the "delete" code in the "information set".

The second imbeds the information set between two sections of the "control" set (i.e. 32 controls, 64 information, 32 controls). This scheme keeps the information set "pure", locates the "master"space and the and the delete in control areas, but has the disadvantage of requiring a somewhat more complex examination to separate the controls from the information sets.

The following thoughts were noted in considering this area:

a) The two most promising arrangements for the binary sequence are specials - alpha-numerals or specials - numerals-alpha. For simplicity of logic and hardware it is desirable that the alphabet be contained in one half of the set and the specials-numerals in the other. It is desirable to have the punctuation and certain other specials "low". Hence the special-numeral-alpha arrangement seems most desirable.

b) Since a 128 character set would most likely be divided into two major sections (64 controls and "non printable" specials and 64 information), the information set should not contain controls.

c) The need for a reasonable 16 character numeric set and the requirement for double purpose keys must be given due consideration.

6.3 Set Content

This subject was studied in some detail. A number of information set arrangements were investigated. The result of the discussion was the identification of the fact that a number of the basic problems exist in reaching agreement as to the detailed content of the information set. Each member is to study this area and be prepared to discuss it in more detail at the next meeting.

6.4 Fieldata

There was some discussion as to the exact nature of the Fieldata code as used by the various branches of the military. With regard to the "information" set the following problems were noted:

a) The collating sequence is less than ideal.

b) Control codes are included in the information set.

c) There is not a reasonable "numeric" subset.

d) Expansion to foreign alphabets would present quite a problem.

e) Expansion to 12 "numerals" (for English monetary system) would present problems.

f) The "double purpose" key arrangement would be non-standard.

It was noted that a "standard" different than Fieldata would have to be more logical, simpler to implement and solve the communication-data processing problems more advantageously if it is to be accepted. This problem is complicated by the fact that "Fieldata" hardware is either in existence or under development.

7. THE NEXT MEETING WILL BE HELD IN NEW YORK, JUNE 7th & 8th.

C. E. Macon

C. E. Macon
Secretary

CEM:aks

ROUGH DRAFT
May 4, 1961
Revised
(5/31/61)

Subject: SOME POINTS FOR CONSIDERATION IN DETERMINING STANDARD CODED CHARACTER SETS

By: C. E. Macon

1) The purpose of standards in this area is to "facilitate the interchange of information between data processing systems and between such systems and associated equipment". While the common carrier system is one means of accomplishing such interchange, it is most certainly not the only means nor necessarily the principal means by which such interchange will be accomplished. Consider the following:

   a) Physical transfer of a medium from one device to another.

   b) Physical interconnection of the two devices.

   c) Use of a special communication service.

2) With regard to data processing systems and associated equipment, the following conclusions can be reached:

   a) There will be a significant amount of equipment employing each code level (with the possible exception of 5 level code).

   b) Interchange of information will be required between equipments of differing levels of internal codes.

   c) In such interchange it will be the burden of the equipment employing the larger set to structure the message to be transmitted in terms of the smaller set. Further, the larger machine will have to interpret the messages received from the smaller machine.

   d) Straight forward logical transforms can, in general, be easily accomplished in such equipment.

3) With regard to information the following are generally true:

   a) The information to be interchanged will fall into one of two major classes: Programs and Data.

---

   b) With regard to interchange, data will comprise the vast bulk of expected traffic.

   c) With regard to data the following principle applies:

      Data, in general, must be at one stage or the other be printed in humanly intelligible graphics. Page and line printer are the means by which this printing is accomplished. At the present state of the art, such printers are restricted to a limited set of graphics (often 64 or less).

   d) With regard to programs:

      The strong trend is toward expressing programs in terms of problem oriented languages. Such languages are interpreted by the processor involved into machine language. While such languages employ an expanded set of graphics for human to human communication, the set is generally restricted when a machine is involved (Symbol pairs are often used to replace the single graphics of the larger set). It would seem then that a restricted set for information interchange would be tenable.

4) The structure of the information to be interchanged will depend on the knowledge which the sender has of the means of interchange and its eventual destination. In general the structure will be restricted to the "lowest common denominator" in the interchange link, be it transmitting device, means of interchange, or receiving device. Also the sender will wish to use the most sophisticated structure possible. For example, if two 8 level data processors are interconnected and both employ the same internal code, the basic structure would not employ a 6 level code for information interchange.

5) It must be recognized that a standard set (or family of sets) will not be employed in all cases of information interchange nor will such standards solve all problems associated with interchange. The best that can be hoped for is that such standards will be employed in the majority of cases in which information interchange is involved and that they will solve the vast majority of problems associated with information interchange.

6) It must be recognized that a new standard will result in conversion of certain existing equipment but will predominately be implemented with new equipment.

C E Macon

C. E. Macon

NMAH 310/1

ISO/TC 97 (Geneva 1961 -14)19 E

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

FIRST MEETING OF ISO/TC 97 - DIGITAL COMPUTERS AND DATA PROCESSING MACHINES

SESSION OF 18 MAY 1961

Original : French

BRIEF MINUTES

WORKING GROUP B - CHARACTER SETS AND CODING

Meeting held on Thursday, 18 May, 1961, from 2 to 6 P.M.
Chairman : Mr. Feissel (France)
Delegations present : Belgium, France, Germany, Italy, Sweden, U.K., U.S.A.

The Committee followed the agenda given for the six groups in document 16E.

Survey of field of work

The group heard the following communication from Working Group E, presented by Mr. Frontard : View of Working Group E (Programming Languages) on their boundary with Working Group B (Character Sets) :

1. "Grouping of information"

We believe that any work needed on individual characters such as message delimiters is properly the work of Group B as well as their relationships in the sense of collation sequence. However, any grouping of informations into files, records, blocks, items, fields, sub-fields, etc. is part of the programming language task.

2. "Identifications of informations"

This phrase must not be interpreted to mean logical identification of information, but rather must be physical identification such as location. Logical identification of information is the prerogative of the user of equipment!

- - - -

Having regard to this communication, and after discussion of a bilingual text, the Group agreed on the following version :

Character Sets and Coding

Scope : Standardization of character sets, including indicators and controls, coded representation of characters and of analog quantities for the interchange of information among information processing systems and associated devices, equipments or machines.

Program of Work

1. Characters :
   - To determine the characteristics and content of such groups as alphabets, digits, punctuation, indicators and control.
   - To select character sets required for data processing.
   - To establish an ordering sequence for the characters in each set.
2. Indicators and controls
   - To determine format indicators as are required to delimit information entities.
   - To determine indicators and controls such as are required for data transmission, recording onto media, and other purposes as required.
3. Codes :
   - To determine coded representations of the characters in the sets.
   - To provide an orderly and logically simple transformation for progression of set sizes, minimising ambiguities in graphic to code correspondance.
   - To determine coded representations of analog quantities at the output of analog to digital or at the input of digital to analog converters.

Statement by delegations on work done at the national and international level

The U.K. delegate mentioned the existence of a standard relating to punched card codes, and also of work on punched tapes which is at various stages of advancement. This work is concerned, amongst other things, with a code suitable for the control of machine-tools. Work with more limited objectives is also in hand on magnetic tape codes.

The U.S.A. delegate mentioned work at various stages of advancement in the sphere of codes for punched cards and tapes, He stated that work very important to the interests of the group is in progress in his country.

The French delegate mentioned that since 1959, study at the national level had been organized by agreement between the French Electrotechnical Committee and AFNOR. Representatives of manufacturers, users, of administrative and of scientific and professional associations are taking part in the work.

The German delegate mentioned that work had been done in conjunction with the CCITT relating to telegraphic codes. There had been set up in ~~ONA~~ CNA a committee on computer matters, and this committee had a sub-committee on character sets.

The Belgian, Italian and Swedish delegates expressed their interest in the sphere of activity of the group, but could not put forward any special activity in their national bodies.

At the international level, several delegates mentioned their participation in the work of ECMA.

Five countries (France, Germany, Italy, U.K., U.S.A.) announced their definite participation in the work envisaged in the context of this working group; the other two countries represented in the Group expressed their interest, and will examine in their national bodies the question of active participation.

List of subjects which may become ISO projects
After discussion, it was decided that the items of concern which had been explained by the different delegations will be examined according to a programme of work such as had been proposed.

Method of work until the next meeting of the Group
1st PHASE. The secretariat will collect, by correspondence with the committee members, all items of information which had been mentioned in the discussion, and all possible complementary items.

2nd PHASE. The secretariat will take pains to extract from these items material for preliminary projects of ISO. In addition, all preliminary projects suggested by committee members will be welcomed by the secretariat.

3rd PHASE. A further meeting of the Group will be arranged during which these projects will be examined, and at the end of which proposals will be made to ISO/TC 97 as to the best way of bringing their study to a satisfactory conclusion.

420 LEXINGTON AVENUE NEW YORK 17, NEW YORK MURRAY HILL 3-6433

DATA PROCESSING GROUP
OFFICE EQUIPMENT MANUFACTURERS INSTITUTE

JOHN H. HOWARD DIRECTOR
HERBERT S. BRIGHT ENGINEERING DIRECTOR

Subcommittee X3-2 - Character Sets and Data Formats of ASA X3
Sectional Committee on Data Processing Standards

MINUTES

Eighth Meeting, June 7th and 8th, 1961
ASA Headquarters, New York, N. Y.

SUMMARY

The Chairman reported on the ISO meeting. The detailed information set was derived and tentatively agreed upon as was the organization of the 7 level (128 code) set.

Mr. I. C. Liggett, Chairman

Mr. C. E. Macon, Secretary

NMAH 316/2

X3-2 Subcommittee
on
Character Sets & Data Formats
of the
American Standards Association
X3 Sectional Committee
Sponsored by
O.E.M.I.

June 9, 1961

MINUTES

MEETING OF JUNE 7th & 8th

1. MEMBERSHIP & ATTENDANCE

1.1 Members Present

John Auwaerter - Teletype Corp.

Leon Bloom - NCR

T. H. Bonn - Remington Rand

John Booth - (alternate for Robert Gryb - AT&T Company)

L. L. Griffin - Navy Department

I. C. Liggett - IBM

C. E. Macon - Burroughs Corporation

Joe Murglan - (alternate for John Auwaerter - Teletype Corp.)

Roy W. Reach - Minneapolis Honeywell

H. J. Smith, Jr. - IBM

H. Spielman - RCA

H. Tholstrup - Friden Inc.

Allen L. Whitman - Bell Telephone Lab.

1.2 Members Absent

Capt. W. J. Luebbert - West Point

Lawrence J. Schoenberg - Monroe Calculating Machine

1.3 Changes in Membership

It was agreed to accept Mr. Schoenberg's verbal resignation and to invite him to rejoin the committee when he is again able to actively participate. The secretary was directed to so notify Mr. Schoenberg.

2. MINUTES

The Minutes of April 26th and 27th Regular Meeting and the Minutes of the Informal Meeting of May 8th and 11th were approved.

3. DOCUMENTS DISTRIBUTED

3.1 "Graphical Symbols for Automatic Control" from Technical Committee # (Graphical Symbols) of the IEC.

3.2 Report: Coded Character Set discussions in ASA X3-2 Subcommittee, present status of - by L. L. Griffin.

3.3 Analysis of 14 European Alphabets - prepared by H. McG. Ross 4-25-61.

4. ISO - TC-97 MEETING

The Chairman reported on the recent ISO, TC-97 meeting. He will furnish copies of the minutes for the meeting to the members. The following subcommittees of TC-97 were established. The country holding the secretariat is indicated:

Glossary - Netherlands
Character Sets - France
Digital In/Out Media - Italy
Character Recognition - United States
Problem Oriented Languages - United States
Data Transmission - United States

5. CODED CHARACTER SETS

The information section (64 graphics and associated codes) was discussed and detailed. Tentative agreement was reached on the details of this section. This 64 character subset is delineated in Figure 2. The basic organization (Figure 2) of the 7 level (128) set was agreed upon.

The deliberations leading to the above agreements have been quite extensive. A large number of reports have been studied, quantities of data have been gathered and many investigations of possible solutions have been conducted. In order that some insight can be presented as to the nature of this work a Task Group has been established to prepare a summary report.

The Task Group consists of Messrs. Auwaerter, Griffin, Luebbert, Macon and Smith. The Group will meet June 20th and 21st to prepare the initial draft. This draft, together with agreed upon Information Set and 7 Level Organization, will be presented informally to several of the representatives agencies of the DOD who are concerned with Fieldata and standard character sets, on June 29th in Washington D.C.

6. NEXT MEETING

The next regular meeting will be held June 29th and 30th in Washington D.C. Time and place will be announced later.

C E Macon/aks

C. E. Macon
Secretary

CEM:aks

	000	001	010	011	100	101	110	111
0000	Master Space		ƀ	0	=	K		
0001	UC		!	1	≠	L		
0010	LC		"	2	#	M		
0011	CR		?	3	%	N		
0100	LF		$	4	↑	O		
0101			'	5	←	P		
0110			&	6	A	Q		
0111			-	7	B	R		
1000			(	8	C	S		
1001			)	9	D	T		
1010			;	+	E	U		
1011			:	~	F	V		
1100			*	<	G	W		
1101			/	>	H	X		
1110			,	x	I	Y		Escape
1111			.	|	J	Z		Delete

X3.2 agreed on this basic
organization at 61 Jun 9 mtg.
(see other side)

Figure 2

CEM:aks

June 9, 1961

X3-2 TENTATIVE RECOMMENDATIONS ON A STANDARD CODED CHARACTER SET FOR THE INTERCHANGE OF INFORMATION FOR DATA PROCESSING SYSTEMS AND COMMUNICATIONS

INTRODUCTION

The X3-2 Subcommittee was organized and held its first meeting on October 4th, 1960. Since that time nine meetings have been held, the majority of which were two day meetings. In the interval between meetings a great deal of work and study was accomplished. The meetings being predominantly of a coordinating and group discussion nature. The recommendations indicated below therefore, cover essentially nine months of work accomplished by the members of the subcommittee. More details on the organization's scope, objectives, etc. of the committee are included in the appendices for reference.

OBJECTIVES

The underlying aim of the subcommittee is to recommend a coded character set which will facilitate the interchange of information between data processing systems and data processings systems and associated equipment. It is recognized that this interchange will often include communication systems which are used for the transmission of English text as their common mode of operation.

It was also recognized that many codes do exist and that the requirements of various specific applications are quite different and can most readily be met by special codes. However, it was believed that a standard code usable by the majority of people would be highly desirable. The recommendations indicated below outline such a coded character set.

APPROACH - DOD STANDARD

In approaching the task outlined, the committee decided that it would be most desirable to use wherever possible, work that had already been accomplished in this area and if at all possible, adopt a code which existed and was in wide use. A review of codes in this area brought forth the fact that none of the existing codes in complete detail fulfilled what the committee felt was the requirement for such a standard code. However, of the multitudinous of codes considered, the Department of Defense Standard in many respects came the closest. As a result, the recommendations outlined below essentially present a modification to the existing Department of Defense Standard.

Gentlemen: It is suggested that the Department of Defense Standard be shown here as a figure.

CEM:aks

NMAH 310/2

RECOMMENDED MODIFICATIONS

Gentlemen: I believe that the recommended modifications are outlined reasonably well in the appendix and that some abbreviated form of this discussion be included here.

FIELDATA II

Gentlemen: I am not sure whether it would be prudent to use the nomenclature Fieldata II or Fieldata 1961. However, some tie-in here would be most useful, I believe. At this point I have included a Figure 2.

SUMMARY OF RATIONAL

I believe inclusion of a summary of statement of the items included in the appendix would be desirable at this point.

CONCLUSIONS

Gentlemen: I feel that the conclusions should include the fact that it would be most desirable for the military to consider a modification to Fieldata which includes our recommendations. I believe that it should be pointed out that there is considerable latitude in the control section of the code and that certain of the items, that is exact characters in the code, could be replaced or rearranged within rather specific limits. It might pay to identify exactly which of these characters we are willing to negotiate on. The predominant conclusion should be that we have here an excellent code, as near as we can tell, and that we would like to work with those active in Fieldata to produce a suitable code for all concerned. As another point here, I think that it should be strongly indicated that a rather large segment of industry is represented on the committee and that it is most likely that the companies represented will adopt the X3-2 standard when it is established. It might be a point to our favor if we indicated that should Fieldata come out with a modified version which meets the recommendations made, that the X3-2 committee would be perfectly happy to adopt this standard and recommend it as the X3-2 standard giving a large measure, if not all the credit, to Fieldata.

C. E. Macon/aks

C. E. Macon

CEM:aks

X3-2 Code Alphabet

Set Being Studied for International Compatibility

	000	001	010	011	100	101	110	111
0000	Null		ƀ	0	=	P		
0001			!	1	A	Q		
0010			"	2	B	R		
0011			?	3	C	S		
0100			$	4	D	T		
0101			'	5	E	U		
0110			&	6	F	V		
0111			-	7	G	W		
1000			(	8	H	X		
1001			)	9	I	Y		
1010			;	+	J	Z		
1011			:	[	K	≠		
1100			*	<	L	#		
1101			/	>	M	%		
1110			,	x	N	↑		Esc.
1111			.	|	O	←		Del.

from 61 Jun 29 joint mtg with DOD

NMAH 31./2

REF 61 Jun 7

Proposed

X3-2 Code Alphabet

	000	001	010	011	100	101	110	111
0000	Null		b̸	0	=	K		
0001			!	1	≠	L		
0010			"	2	#	M		
0011			?	3	%	N		
0100			$	4	↑	O		
0101			'	5	←	P		
0110			&	6	A	Q		
0111			-	7	B	R		
1000			(	8	C	S		
1001			)	9	D	T		
1010			;	+	E	U		
1011			:	~	F	V		
1100			*	<	G	W		
1101			/	>	H	X		
1110			,	x	I	Y		Esc.
1111			.	|	J	Z		Del.

APPENDIX A June 9, 1961

SUMMARY OF DATA PROCESSING STANDARDS ACTIVITIES

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

The ISO is composed of the national standards bodies of 44 different countries. It acts as the world's clearing house for the development and promotion of international standards. In the ISO, the ASA serves as the United States member body reflecting the viewpoint of the American industry. Currently, technical work is being carried on in 96 different projects which range in subject matter from hypodermic syringes to textiles to refrigeration to machine tools.

An ISO project is identified when, after having been proposed by one member body, at least five nations agree to participate in the work. The secretariat is allocated to one member body. This means that the nation accepts the responsibility of conducting meetings of the Technical Committee, preparing and circulating minutes, drafting proposals and, in general, all the normal duties attached to secretarial services. The United States has been selected as the secretariat for the Technical Committee 97 of the ISO. This is the committee on computers and data processing standards.

A proposed standard is re-drafted through the normal channels of the ISO until a maximum amount of acceptance is reached and then the document is sent to the General Secretary of the ISO in Geneva. This document is then distributed as a "draft ISO recommendation" by the ISO Council (so long as all the other procedures have been followed in the course of its development). It should be noted that such a draft recommendation can be approved by a simple majority opinion of the member nations. It is possible under the Bylaws and Procedures of the ISO to process the document one step further so that it becomes an "ISO Standard." Apparently this step is rarely taken. Essentially then, the "draft ISO recommendation" constitutes the world standard on the item in question.

X3 SECTIONAL COMMITTEE

Subsequent to the identification of the TC97, a general conference on office machines and data processing machines was called by the American Standards Association on January 13, 1960. In this general conference the X3 Sectional Committee was established with the following scope: "Create standards for logical representation of characters and character format in the media used for interchange of instructions, data and control information between data processing equipment together with orderly provisions for expansion and alternatives. Standardize terminology and definition of data processing operations and functions." Subsequent to this general conference the OEMI was invited to accept sponsorship of the proposed project on data processing machines and did in fact accept sponsorship of this activity.

CEM:aks

NM AH 310/2

The X3 Sectional Committee was authorized and established and the first meeting of this committee was held August 4, 1960. At this meeting six subcommittees were identified. These are:

X3-1	Character Recognition
X3-2	Character Sets and Data Formats
X3-3	Data Transmission
X3-4	Common Problem Oriented Languages
X3-5	Definition of Terms and Glossary
X3-6	Procedures for Defining Data Processing Applications Studies

The X3 Sectional Committee is constituted of the following classes of membership:

1. Manufacturers
2. Users
3. General Interest Group

The feeling of the Sectional Committee was that approximately 20 would constitute a reasonable working membership. It was decided that 6 members from each group would constitute the membership of the Sectional Committee. Appropriate members were nominated and elected. It was established that each of the six manufacturers on the Sectional Committee level would chairman one of the subcommittees. This has, in fact, been done. (Note that the Users and General Interest membership has been expanded slightly over the original 6 each. The total X3 membership is currently about 22).

The subcommittees are viewed as staff committees of the parent Sectional Committee. Essentially the members of the subcommittees are technical experts in that given field for the industry. These subcommittee members are to work together in generating recommended standards. In this context the subcommittee members are not representing any particular company or organization. They are representing themselves and are strictly "workers" in the subcommittee activities.

The operation is envisioned to be the following: First, after a thorough study by the subcommittee, a proposed or recommended standard will be identified. This standard is then forwarded to the X3 Sectional Committee. It is reviewed by the membership of that committee which is comprised of approximately equal numbers of manufacturers, users and general interest people. Following approval by the Sectional Committee the recommended standard is passed on to the Engineering Group in the sponsoring organization (in this case, the Office Equipment Manufacturers Institute). If approved by this Engineering group, it will be forwarded to the American Standards Association for approval. The operation of the American Standards Association essentially is to publish the recommended standard as "tentative standard". Often times this standard will be published in trade magazines and such like to insure that everyone who may have a vested interest in the standard is aware of its existence.

At any of these approval levels the recommended standard may be disapproved and returned to the originating subcommittee for further work. It should further be noted that all negative opinions must be documented in the approval procedure standard. That is to say, that the standard must have unanimous approval or the negative opinions must be recorded and a reasonable argument presented as to why the negative opinion should not constitute a disapproval of the standard.

Following this thorough and rather tedious procedure, the standard is approved and is then identified as an American Standard and published as such. It is, of course, obvious that an approved American Standard would constitute the ASA's recommendation to the International Standards Organization for a particular subject area. It is also obvious that the manufacturers, users and general interest groups have had three distinct and definite opportunities to veto or register their objection to a standard before it is established as such.

C. E. Macon/aks

C. E. Macon

420 LEXINGTON AVENUE NEW YORK 17, NEW YORK MURRAY HILL 3-6433

DATA PROCESSING GROUP
OFFICE EQUIPMENT MANUFACTURERS INSTITUTE

JOHN H. HOWARD DIRECTOR
HERBERT S. BRIGHT ENGINEERING DIRECTOR

NMAH 310/2

Subcommittee X3-2 - Character Sets and Data Formats of ASA X3
Sectional Committee on Data Processing Standards

MINUTES

Eighth Meeting, June 7th and 8th, 1961
ASA Headquarters, New York, N. Y.

SUMMARY

The Chairman reported on the ISO meeting. The detailed information set was derived and tentatively agreed upon as was the organization of the 7 level (128 code) set.

Mr. I. C. Liggett, Chairman

Mr. C. E. Macon, Secretary

X3-2 Subcommittee
on
Character Sets & Data Formats
of the
American Standards Association
X3 Sectional Committee
Sponsored by
O.E.M.I.

June 9, 1961

MINUTES

MEETING OF JUNE 7th & 8th

1. MEMBERSHIP & ATTENDANCE

1.1 Members Present

John Auwaerter - Teletype Corp.

Leon Bloom - NCR

T. H. Bonn - Remington Rand

John Booth - (alternate for Robert Gryb - AT&T Company)

L. L. Griffin - Navy Department

I. C. Liggett - IBM

C. E. Macon - Burroughs Corporation

Joe Murglan - (alternate for John Auwaerter - Teletype Corp.)

Roy W. Reach - Minneapolis Honeywell

H. J. Smith, Jr. - IBM

H. Spielman - RCA

H. Tholstrup - Friden Inc.

Allen L. Whitman - Bell Telephone Lab.

1.2 Members Absent

Capt. W. J. Luebbert - West Point

Lawrence J. Schoenberg - Monroe Calculating Machine

1.3 Changes in Membership

It was agreed to accept Mr. Schoenberg's verbal resignation and to invite him to rejoin the committee when he is again able to actively participate. The secretary was directed to so notify Mr. Schoenberg.

2. MINUTES

The Minutes of April 26th and 27th Regular Meeting and the Minutes of the Informal Meeting of May 8th and 11th were approved.

3. DOCUMENTS DISTRIBUTED

3.1 "Graphical Symbols for Automatic Control" from Technical Committee # (Graphical Symbols) of the IEC.

3.2 Report: Coded Character Set discussions in ASA X3-2 Subcommittee, present status of - by L. L. Griffin.

3.3 Analysis of 14 European Alphabets - prepared by H. McG. Ross 4-25-61.

4. ISO - TC-97 MEETING

The Chairman reported on the recent ISO, TC-97 meeting. He will furnish copies of the minutes for the meeting to the members. The following subcommittees of TC-97 were established. The country holding the secretariat is indicated:

Glossary - Netherlands
Character Sets - France
Digital In/Out Media - Italy
Character Recognition - United States
Problem Oriented Languages - United States
Data Transmission - United States

5. CODED CHARACTER SETS

The information section (64 graphics and associated codes) was discussed and detailed. Tentative agreement was reached on the details of this section. This 64 character subset is delineated in Figure 2. The basic organization (Figure 2) of the 7 level (128) set was agreed upon.

The deliberations leading to the above agreements have been quite extensive. A large number of reports have been studied, quantities of data have been gathered and many investigations of possible solutions

---

X3-2 TENTATIVE RECOMMENDATIONS
ON A STANDARD CODED CHARACTER SET FOR
THE INTERCHANGE OF INFORMATION
FOR DATA PROCESSING SYSTEMS
AND COMMUNICATIONS

INTRODUCTION

The X3-2 Subcommittee was organized and held its first meeting on October 4th, 1960. Since that time nine meetings have been held, the majority of which were two day meetings. In the interval between meetings a great deal of work and study was accomplished. The meetings being predominantly of a coordinating and group discussion nature. The recommendations indicated below therefore, cover essentially nine months of work accomplished by the members of the subcommittee. More details on the organization's scope, objectives, etc. of the committee are included in the appendices for reference.

OBJECTIVES

The underlying aim of the subcommittee is to recommend a coded character set which will facilitate the interchange of information between data processing systems and data processings systems and associated equipment. It is recognized that this interchange will often include communication systems which are used for the transmission of English text as their common mode of operation.

It was also recognized that many codes do exist and that the requirements of various specific applications are quite different and can most readily be met by special codes. However, it was believed that a standard code usable by the majority of people would be highly desirable. The recommendations indicated below outline such a coded character set.

APPROACH - DOD STANDARD

In approaching the task outlined, the committee decided that it would be most desirable to use wherever possible, work that had already been accomplished in this area and if at all possible, adopt a code which existed and was in wide use. A review of codes in this area brought forth the fact that none of the existing codes in complete detail fulfilled what the committee felt was the requirement for such a standard code. However, of the multitudinous of codes considered, the Department of Defense Standard in many respects came the closest. As a result, the recommendations outlined below essentially present a modification to the existing Department of Defense Standard.

Gentlemen: It is suggested that the Department of Defense Standard be shown here as a figure.

CEM:aks

RECOMMENDED MODIFICATIONS

Gentlemen: I believe that the recommended modifications are outlined reasonably well in the appendix and that some abbreviated form of this discussion be included here.

FIELDATA II

Gentlemen: I am not sure whether it would be prudent to use the nomenclature Fieldata II or Fieldata 1961. However, some tie-in here would be most useful, I believe. At this point I have included a Figure 2.

SUMMARY OF RATIONAL

I believe inclusion of a summary of statement of the items included in the appendix would be desirable at this point.

CONCLUSIONS

Gentlemen: I feel that the conclusions should include the fact that it would be most desirable for the military to consider a modification to Fieldata which includes our recommendations. I believe that it should be pointed out that there is considerable latitude in the control section of the code and that certain of the items, that is exact characters in the code, could be replaced or rearranged within rather specific limits. It might pay to identify exactly which of these characters we are willing to negotiate on. The predominant conclusion should be that we have here an excellent code, as near as we can tell, and that we would like to work with those active in Fieldata to produce a suitable code for all concerned. As another point here, I think that it should be strongly indicated that a rather large segment of industry is represented on the committee and that it is most likely that the companies represented will adopt the X3-2 standard when it is established. It might be a point to our favor if we indicated that should Fieldata come out with a modified version which meets the recommendations made, that the X3-2 committee would be perfectly happy to adopt this standard and recommend it as the X3-2 standard giving a large measure, if not all the credit, to Fieldata.

C. E. Macon/aks

C. E. Macon

CEM:aks

	000	001	010	011	100	101	110	111
0000	Master Space		ƀ	0	=	K		
0001	UC		!	1	≠	L		
0010	LC		"	2	#	M		
0011	CR		?	3	%	N		
0100	LF		$	4	↑	O		
0101			'	5	←	P		
0110			&	6	A	Q		
0111			-	7	B	R		
1000			(	8	C	S		
1001			)	9	D	T		
1010			;	+	E	U		
1011			:	~	F	V		
1100			*	<	G	W		
1101			/	>	H	X		
1110			,	x	I	Y		Escape
1111			.	|	J	Z		Delete

X3.2 agreed on this basic
organization at 61 Jun 9 mtg.
(see other side)

Figure 2

CEM:aks

have been conducted. In order that some insight can be presented as to the nature of this work a Task Group has been established to prepare a summary report.

The Task Group consists of Messrs. Auwaerter, Griffin, Luebbert, Macon and Smith. The Group will meet June 20th and 21st to prepare the initial draft. This draft, together with agreed upon Information Set and 7 Level Organization, will be presented informally to several of the representatives agencies of the DOD who are concerned with Fieldata and standard character sets, on June 29th in Washington D.C.

6. NEXT MEETING

The next regular meeting will be held June 29th and 30th in Washington D.C. Time and place will be announced later.

C E Macon/aks

C. E. Macon
Secretary

CEM:aks

BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION
Formerly Office Equipment Manufacturers Institute
235 East 42nd St.-Pfizer Bldg Suite 620
New York 17, New York
Telephone: MUrray Hill 7-5969

Subcommittee X3-2 - Character Sets and Data Formats of
ASA Sectional Committee X3 on Computers and Data Processing

MINUTES

Ninth Meeting, June 30, 1961
Main Navy Building, Washington, D. C.

SUMMARY

Continuation of the discussions relating to the Mil Standard 188A and X3-2 Recommendations was carried on. An Editor's Note and paper appearing in the Communications of the ACM was discussed. Assignments were made to continue the work of completing the X3-2 Character Set under study.

NMAH 316/2

X3-2 Subcommittee
on
aracter Sets & Data Formats
of the
erican Standards Association
X3 Sectional Committee
Sponsored by
O.E.M.I.

July 28, 1961

MINUTES

MEETING OF JUNE 30th

Main Navy Building
Washington, D. C.

Convened: 9:45 AM

1. MEMBERSHIP & ATTENDANCE

1.1 Members Present

John Auwaerter - Teletype Corp.

Leon Bloom - NCR

T. H. Bonn - Remington Rand

John Booth - AT&T Company

L. L. Griffin - Navy Department

I. C. Liggett - IBM

Thomas J. McNamara - Honeywell EDP Division

C. E. Macon - Burroughs Corporation

H. J. Smith, Jr. - IBM

H. Spielman - RCA

Allen L. Whitman - Bell Telephone Laboratories

1.2 Members Absent

Robert Gryb - AT&T Company

H. Kleinberg - RCA

Major W. J. Leubbert - West Point

Roy W. Reach - Minneapolis Honeywell

H. Tholstrup - Friden Inc.

.3 Observers Present

Willis DeHart - DCA

Dave Haratz - Ft. Monmouth

Dick Utman - Remington Rand

Wally Velander - Navy Management Office

2. MIL STANDARD 188A AND X3-2 RECOMMENDATION

The most of the meeting was devoted to discussing code set requirements and criteria with the Government personnel present.

3. COMMUNICATIONS OF THE A.C.M.

In the May, 1961 issue of the Communications of the A.C.M., Volume 4, Number 5, a paper entitled "Design of an Improved Transmission/Data Processing Code" by R. W. Bemer, H. J. Smith, Jr. and F. A. Williams, Jr. appeared in the Standard Section together with an Editors Note. Mr. Herbert S. Bright is the Editor of the Standards Section for this periodical and also Chairman of the ASA X-3 Sectional Committee. The paper and most particularly the Editors Note, referred to the activities of X3-2. The Committee objected most strongly to the implication of these items.

Since this matter concerned X3-2 directly, it was decided that X3-2 should issue a statement to be published in A.C.M. on the subject. Accordingly the four points enumerated in the attached letter were developed by the Committee. By unanimous decision of the Committee these points were approved and the Secretary was directed to include them in a letter to the Editor of A.C.M.

4. ASSIGNMENTS

4.1 Control Codes

Communications - Auwaerter, Booth and Whitman
Data Processing - Bloom

4.2 International Problem - Liggett and Auwaerter

NEXT MEETING

August 2 and 3 and possibly 4th

Location - AT&T
Room 1712
195 Broadway
N. Y.

(John Booth will arrange)

Time - 9:30 AM

CE Macon

C. E. Macon
Secretary

Burroughs Corporation

ELECTRODATA DIVISION

460 SIERRA MADRE VILLA • PASADENA, CALIFORNIA

July 6, 1961

Dr. Alan J. Perlis
Editor-in-Chief
Carnegie Institute of Technology
Pittsburgh 13, Pennsylvania

Dear Sir:

A paper entitled "Design of an Improved Transmission/Data Processing Code" by R. W. Bemer, H. J. Smith and F. A. Williams Jr. appeared in Communications of the ACM, Volume 4, Number 5, May 1961. This paper, along with the Editor's Note, was reviewed by the ASA X3-2 Committee at the regular meeting of June 28 and 29th. It was the unanimous decision of the ASA X3-2 Committee that the following remarks be directed to your attention:

1) The subject paper was one of a number of such papers by a variety of authors which have been received and reviewed by the ASA X3-2 Committee.

2) The coded character set currently being considered for recommendation by the ASA X3-2 Committee differs considerably from that presented in the subject paper in many highly important respects and is by no means a direct outgrowth of the material presented in the subject paper.

   Several man-years of research and study expended over the past nine calendar months have brought into being the coded character set currently being considered by X3-2.

3) The ASA X3-2 recommendation will be a single coded character set to serve as the standard for information interchange between data processing systems and between such systems and associated equipmen -- not one standard for Communications and another for Data Processing as suggested in the subject paper.

4) The points presented in the subject paper with which the ASA X3-2 Committee is at variance are too numerous to discuss in this letter. They will be covered implicitly in the supporting documentation for the true ASA X3-2 coded character set recommendation.

Very truly yours,

C E Macon

C. E. Macon
Secretary ASA X3-2

CEM:aks

Copy: H. S. Bright
Standards Editor
420 Lexington Avenue
New York 17, N. Y.

NMAH 310/2

Advanced Information on Proposed 4-Row Keyboard - File 37729

July 12, 1961

MR. T. L. DIMOND

For your information, I am attaching a copy of a sketch showing the proposed 4-row keyboard which would result from the "graphic" set now being proposed by OEMI Committee X3-2. This keyboard was designed by John Auwaerter with the exception of the underlined control functions which I have added partly in accordance with our agreements with Teletype as to where functions like Bell and Feedout should go.

From the standpoint of ordinary Bell System teletypewriter operation, this keyboard is in my opinion a monstrosity. It representamany compromises, with the goal of a single code such that data generated from the teletypewriter keyboard could go directly into a computer without conversion. Certain representatives of the military are extremely emphatic in their belief that this is not a significantly important objective. The Bell System members of committee X3-2 need advice from others as to the relative importance of this objective as compared, for instance, with a keyboard nearer that of the commoner typewriter.

A complete memorandum describing the present X3-2 committee's code proposal will be distributed in a few days.

Allen L. Whitman

NY-3112-ALW-mdb

ALLEN L. WHITMAN

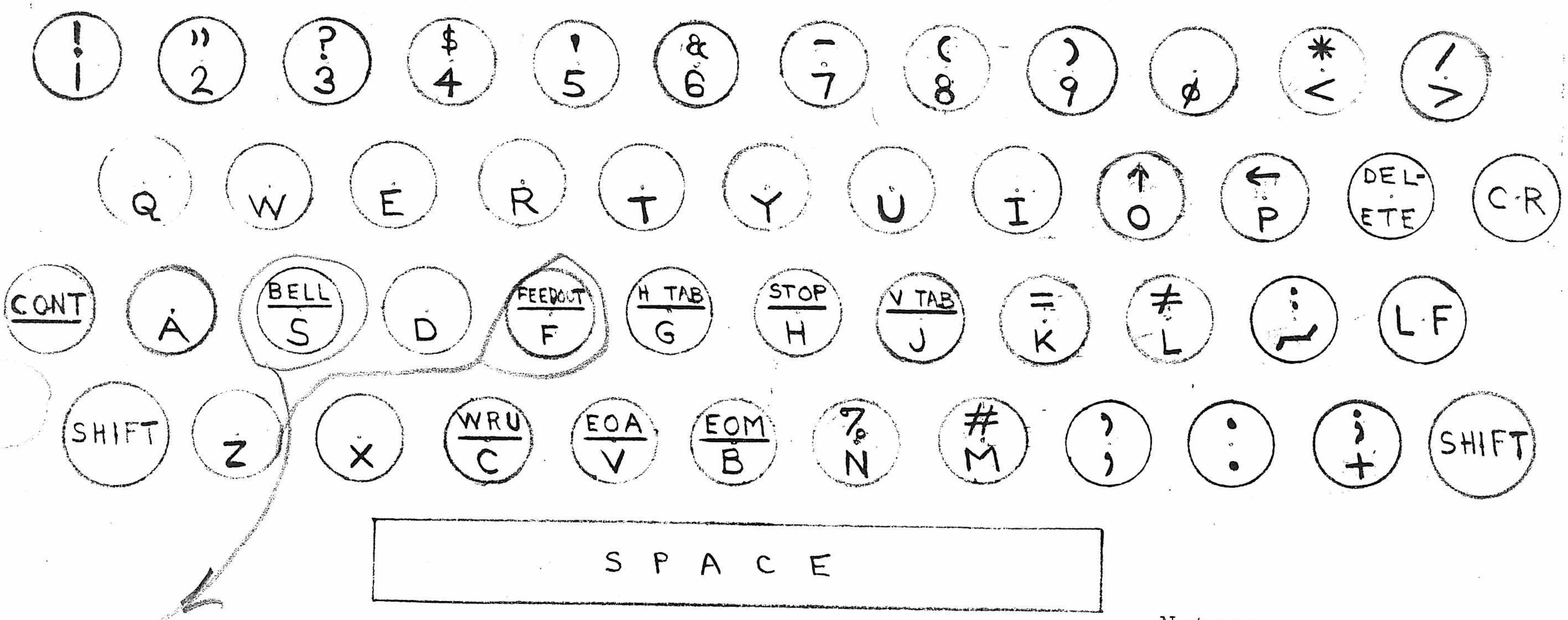
Att.
As above

Copies to
Messrs. L. W. Claussen - AT&TCo
R. M. Gryb - AT&TCo
J. B. Booth - AT&TCo
J. F. Auwaerter - Teletype 7/14x ← THIS COPY FOR
J. R. Harris - MH
W. Y. Lang - NY
E. R. Robinson - NY

NMAH 310/2

COPY
BELL TELEPHONE LABORATORIES
INCORPORATED

This copy for John Auwaerter



Proposed Keyboard Layout
Based on X3-2 Subcommittee
7-Bit Code of June 9, 1961

Fig. 1

Keyboard
Fig. 1

JFA: Bill Lang's memo of 6-26-61 is in error on these. What is wanted for present trial Units is as above for these 2 keys.

Notes:

1. Depression of shift key changes bit No. 4 from mark to space for upper keytop symbols not underlined.

2. Depression of control key changes bit No. 6 from mark to space for underlined upper keytop symbols.

RJS - ALW 7-11-61

RESEARCH LABORATORIES
GENERAL MOTORS CORPORATION

July 13, 1961

Mr. H. A. McCabe
Union Carbide Corporation
Electronic Data Processing Dept.
37th Floor
270 Park Avenue
New York, New York

Dear Hank:

I am enclosing, for distribution to the SHARE body, a set of minutes for a meeting that took place July 6, 1961, with representatives from SHARE, GUIDE and IBM present. The subject of the meeting was the 60 Character Set and the conclusions reached, I feel, are quite acceptable to SHARE.

In all probability, the character set proposed in this set of minutes will be the one recommended to the SHARE body as our SHARE Standard. This 60 Character Set will also be reviewed at the time the proposal is made. You can see from the complexity of the study made that good reasons will be necessary in order to make any changes in the proposed set.

Sincerely,

George F. Ryckman, Chairman
General Standards Committee

GFR:pc

For SSD

Enclosure

NMAH 310/2

GENERAL MOTORS TECHNICAL CENTER
12 MILE AND MOUND ROADS WARREN, MICHIGAN

IBM
Data Processing Division
112 East Post Road
White Plains, New York

International Business Machines Corporation

Telephone: WHite Plains 9-1900

6 July 1961

To: Participants in
30 June Meeting
Expansion Historic IBM Code

Background The announcement of the 1403 printer and extrapolation of its design features, shows the ability to print at some sacrifice in printing speed, character sets which are larger than 48 characters. This has resulted in a number of RPQ's. The standards organizations in SHARE and GUIDE have been developing proposals to assign printing graphics to the additional codes available. At the same time within IBM, proposals have been made for similar expansion of the character sets.

In order to ascertain the needs of the GUIDE and SHARE organizations as well as to present to them certain restrictions on the expansion of the character set, a meeting was arranged with the following:

Mr. R.W. Bemer	IBM
Mr. S.S. Closman	IBM
Mr. R.F. Dean	IBM
Mr. J. Denes	Brookhaven National Lab.
Mr. D. Eastwood	Bell Telephone Lab.
Mr. J. Enms	Pennsylvania State University
Mr. S. Gertz	M.W. Kellogg
Mr. S. Greenfield	IBM
Mr. P. Grymes	Gulf Oil Corp.
Mr. R. Judson	B.F. Goodrich
Dr. W. Kehl	University of Pittsburgh
Dr. D.T. Laird	Pennsylvania State University
Mr. R. Ranshaw	University of Pittsburgh
Mr. G. Rychman	General Motors
Mr. T. Steel	System Development Corp.
Mr. F.A. Williams	IBM
Mr. J. Yarbrough	International Tel. & Tel.

The basic difference between product line and RPQ's was shown. RPQ's are designed to particular customers request by a special engineering department. If additional requests for the RPQ are honored, it is still the original customers specifications. The product line is specified by IBM with the general market in view. RPQ's are rarely incorporated in the product line without changes in specification.

While the meeting was called to discuss a general RPQ and its possible eventual intact inclusion in the product line, such a commitment, of course, could not be made. The conculsions are recommendatory in nature and will serve as strong guide posts for the investigation of possible expansions.

Conclusion The graphics for an extended Historic (i.e., BCD) character set should include the H type arrangement and these additional graphics ; : > < [ ] ~ ↑ \. The typographical design of the ~ was not specified. It is intended that the symbol be some form of logical NOT. The actual code to graphic assignment was left to IBM.

Assumptions

1) The card code to 6 bit representation will be as shown in Figure 1.
2) The collating sequence will be as shown in Figure 2.
3) The 1403 can print larger character sets by use of a "home" position.

Present Situation The A and H type arrangement are the most commonly used. Programming languages are being written using the H arrangement. The characteristic printing of 717 and 1403 types are shown in Figure 3. Codes having numeric portions of zero and ten are not distinguished except for zero and blank. The ‡ is available only on 1403's.

1403 The 240 character chain of the 1403 may be divided to provide many different character set sizes. The set size of 60 is presently of most interest in that most information is presently processed in bytes of 6 bits, i.e. 64 code elements.

Restrictions An intersection of the control codes used on IBM Data Processing machines reveals that seven of the 64 code elements of a 6 bit set are used as controls.

These are:

Group Mark 111111 12-7-8
Terminates WRITE instructions.

Tape Mark 001111 7-8
Interpretation on magnetic tape causes setting of a memory trigger.
It may be interpreted depending upon the Control Unit when encountered:

a) anywhere in a tape record
b) as the first character of a tape record
c) as a single character tape record.

Tape Segment Mark 011111 0-7-8
A form of higher level tape mark for controlling tape movement.

Mode Mark 101111 11-7-8
Signals start and end of numerical mode on 7070 magnetic tape.

Record Mark 011010 0-2-8
Terminates certain MOVE instructions.

Substitute Blank 010000 2-8
Used for blank (000000; No punch) in even parity systems which have only 63 code elements. In moving to even parity both 000000 and 010000 are recorded as 010000. In the reverse direction 010000 becomes 000000.

Word Separator 011101 0-5-8
This 6 bit combination is used to represent the word mark level of the 1401 - 10 series. There are two methods of reading and writing records. In the normal or non-word mark mode (MOVE) each character is copied onto or off external storage, and the word mark plane is ignored. In the word mark mode (LOAD) memory locations with a word mark are written (LOADed on external storage) as the symbol pair word separator - 6 bit memory character. On reading (LOADed into memory) the pair enters a single memory location as a word mark over code element. When the 6 bit word separator is encountered by this write (LOAD on external storage) instruction, a pair of word separators is formed in external storage. On reading (LOADing memory) pairs of word separators enter as a single 6 bit word separator and the last of an odd length string of word separators becomes a word mark over the succeeding character. The combination of a word mark/word separator should not be written (LOADed on external storage) since it cannot be reconstructed by the LOAD instruction.

7090 Internal Code
7090 Internal "BCD" Code is obtained by an "exclusive OR" on the zone bits as follows:

Tape	Internal
00XXXX	00XXXX
01XXXX	11XXXX
10XXXX	10XXXX
11XXXX	01XXXX

$$A_t \veebar B_t \longrightarrow B_i ; \quad A_i \veebar B_i \longrightarrow B_t$$

The tape code 12_8 becomes the memory code 00_8 to accommodate the 63 state even parity tape code.

While, by special programming, almost any of these can be used as data, their use requires special attention to the instructions used in processing the data. For example, to use a record mark as an information bearing symbol rather than as a data delimiter, restricts the use of certain MOVE instructions on the 1401, 1410 and 7080 series machines. Also, the use of the group mark can lead to various record length checks and possible loss of portions of input records. In addition the writing of records containing the group mark on peripheral devices would require positioning of the records prior to memory breaks and the use of a special write instruction. Similar conditions exist for the other control codes.

The additional blank is required for those systems using even parity. In even parity the full character set is 63 rather than 64 code elements. Thus in these systems, the blank is recoded to another legal code element. After these restrictions were explained the group examined the appropriateness of the various symbols. Figure 4 shows these code elements. The graphics chosen to represent these codes are innocuous from the point of view of common information bearing symbols. This is in line with the graphics already used to indicate certain of these control codes. An exception to this is 010000 which is represented by which can be considered a printing blank in 64 character equipment.

Discussion of Graphics for Available Codes With the establishment of the available data codes, and the assumption of a possible printing capacity of 60 graphics including blank, a survey of various standard proposals was distributed. To this was added the set being used by Dr. A. Perlis. In addition an alteration of the SHARE proposal was presented by Mr. George Rychman and Mr. T. Steel. Figure 5 presents the revised chart. The consensus of these standards proposals was that there would be a printing capacity of 60 information graphics. As pointed out above, however, there would be only 56 graphics plus blank available. To aid in reducing the number of graphics called for in the various proposals, reference was made to a tabulation of the graphics used in some 27 of the ALGOL algorithms published in the Communications of the ACM (Figure 6). While these algorithms were mainly in the area of numerical analysis and thus show little use of logical operators, it was pointed out that increased usage of these operators would probably not alter the group of most frequently used symbols.

Graphics Recommended The first premise was that any expansion would be based on the present H type arrangement. This defines 47 graphics and a blank. Four more symbols which should be added are: semicolon, colon, greater than and less than. These exist in all proposals to date. Two more of the symbols would be left and right square bracket. These are called for strongly by various tabulations while they do not exist in all proposals. The remaining three symbols were not as readily arrived at. However, agreement was finally reached upon the use of a form of NOT, an exponentiation or up arrow, and a reverse slant. Mr. R. Judson pointed out that the reverse slant could be used with the normal slant to provide by a symbol pair the AND and OR logical functions. The use of symbol pairs is based upon the already established need for a colon equals. Figure 7 displays the proposed set.

Graphic to Code Assignment The existence of the A and H type arrangements, with their respective areas of use, presents an obstacle to the orderly expansion of the printing set. 56 graphics and blank do not provide sufficient room for all of the desired characters. The ambiguity of A and H will be maintained as a compromise for the expanded set. In addition, further ambiguities in the expanded portions may be created.

To maintain some semblance of order in these substitutions, the following rule will be applied. Both graphics of an ambiguous pair will not exist simultaneously in the same type arrangement, e.g. both) and ◻ will not appear in the same arrangement.

The present symbol pairs are:

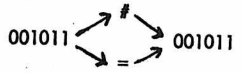
&	+
	)
%	(
#	=
@	'

The graphic ✢ (plussand) has been suggested to combine the pair & and +.

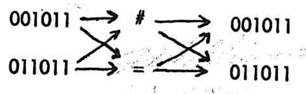
The expansion graphics are : ; > < [ ] ~ ↑ \ . Symbols which may be paired with some of these graphics are ! ? _ .

The existence of two or more graphics for a single code element can be tolerated. To have more than one code for a graphic would positively defeat information interchange. Thus, having 001011 printed as either # or = is definitive as to the code but to have, for example, = printed by both 001011 and 011011 is definitely ambiguous.

Acceptable



Unacceptable



Naturally special situations will probably exist in which particular installations will desire unique character sets. Such requests would be honored by special RPQ. However, local conventions would be unique and IBM programming support would be supplied in the standard character set.

Composition of the Proposed Expanded Graphic Set — The set would consist of:

1	blank	60 Character Printing Set
10	digits 0-9	
26	alphabet A-Z	
11	special - * . , + $ / ( ) ' =	
48		
4	; : < >	
2	[ ]	
3	~ \ ↑	
57		
1	printing blank ƀ	
1	record mark ‡	
1	word separator ~	
60		
1	mode mark △	
3	controls (GM, ≢ ; TM, ✓ ; TSM, ⧻)	
64		

The 11 special symbols are in the order of inclusion in sets. The seven additional data graphics are grouped according to their desirability. The mode mark is singled out for inclusion in a set which prints 60 distinct graphics plus blank since it is the least restrictive control code and is now used on only one machine system.

Figure 7 shows three possible graphic to code assignments. In the divided boxes the H set is in the upper part and the A set is in the lower part.

We wish to thank the participants for their cooperation and comments. We are especially grateful for their presence at a meeting the daybefore the long holiday weekend.

Williams
F.A. Williams,
Corporate Logical
Systems Standards

FAW/ep

Card Code and Six bit Code Conversions

	BA			
8421	00	01	10	11
0000	NONE	NONE 2-8	11	12
0001	1	0-1	11-1	12-1
0010	2	0-2	11-2	12-2
0011	3	0-3	11-3	12-3
0100	4	0-4	11-4	12-4
0101	5	0-5	11-5	12-5
0110	6	0-6	11-6	12-6
0111	7	0-7	11-7	12-7
1000	8	0-8	11-8	12-8
1001	9	0-9	11-9	12-9
1010	0	0-2-8	11-0	12-0
1011	3-8	0-3-8	11-3-8	12-3-8
1100	4-8	0-4-8	11-4-8	12-4-8
1101	5-8	0-5-8	11-5-8	12-5-8
1110	6-8	0-6-8	11-6-8	12-6-8
1111	7-8	0-7-8	11-7-8	12-7-8

Octal
$\underbrace{BA8}\ \underbrace{421}$

Fig. 1

F.A.W. 7-6-61

Collating Sequence

Six Bit Code

	B	A	8	4	2	1	Octal
Low	0	0	0	0	0	0	00
	1	1	1	0	1	1	73
	1	1	1	1	0	0	74
	1	1	1	1	0	1	75
	1	1	1	1	1	0	76
	1	1	1	1	1	1	77
	1	1	0	0	0	0	60
	1	0	1	0	1	1	53
	1	0	1	1	0	0	54
	1	0	1	1	0	1	55
	1	0	1	1	1	0	56
	1	0	1	1	1	1	57
	1	0	0	0	0	0	40
	0	1	0	0	0	1	21
	0	1	1	0	1	1	33
	0	1	1	1	0	0	34
	0	1	1	1	0	1	35
	0	1	1	1	1	0	36
	0	1	1	1	1	1	37
NOTE	0	1	0	0	0	0	20
	0	0	1	0	1	1	13
	0	0	1	1	0	0	14
	0	0	1	1	0	1	15
	0	0	1	1	1	0	16
	0	0	1	1	1	1	17
	1	1	1	0	1	0	72
	1	1	0	0	0	1	61
	1	1	0	0	1	0	62
	1	1	0	0	1	1	63
	1	1	0	1	0	0	64
	1	1	0	1	0	1	65
	1	1	0	1	1	0	66
	1	1	0	1	1	1	67
	1	1	1	0	0	0	70
	1	1	1	0	0	1	71
	1	0	1	0	1	0	52
	1	0	0	0	0	1	41
	1	0	0	0	1	0	42
	1	0	0	0	1	1	43
	1	0	0	1	0	0	44
	1	0	0	1	0	1	45
	1	0	0	1	1	0	46
	1	0	0	1	1	1	47
	1	0	1	0	0	0	50
	1	0	1	0	0	1	51
	0	1	1	0	1	0	32
	0	1	0	0	1	0	22
	0	1	0	0	1	1	23
	0	1	0	1	0	0	24
	0	1	0	1	0	1	25
	0	1	0	1	1	0	26
	0	1	0	1	1	1	27
	0	1	1	0	0	0	30
	0	1	1	0	0	1	31
	0	0	1	0	1	0	12
	0	0	0	0	0	1	01
	0	0	0	0	1	0	02
	0	0	0	0	1	1	03
	0	0	0	1	0	0	04
	0	0	0	1	0	1	05
	0	0	0	1	1	0	06
	0	0	0	1	1	1	07
	0	0	1	0	0	0	10
High	0	0	1	0	0	1	11

Note: On 63 code element equipment, the code 000000 is omitted and 010000 is the lowest code.

F.A.W. 7/6/61

Fig. 2

Printing Characteristic

1403 - 717

	00	01	10	11
0000	blank	α	–	+
0001	1	/	J	A
0010	2	S	K	B
0011	3	T	L	C
0100	4	U	M	D
0101	5	V	N	E
0110	6	W	⊙	F
0111	7	X	P	G
1000	8	Y	Q	H
1001	9	Z	R	I
1010	0	‡	β	γ
1011	=	,	$	.
1100	'	(	*	)
1101				
1110				
1111				

Non printing Codes

α prints as ‡
β " " –
γ " " +

Distinction is not made between the numeric portions 0000 and 1010 except that the hammer is not impulsed on 000000.

On 717's, 000000 is nonprinting and 010000 and 011010 print as blank.

Fig. 3

F.A.W 7/6/61

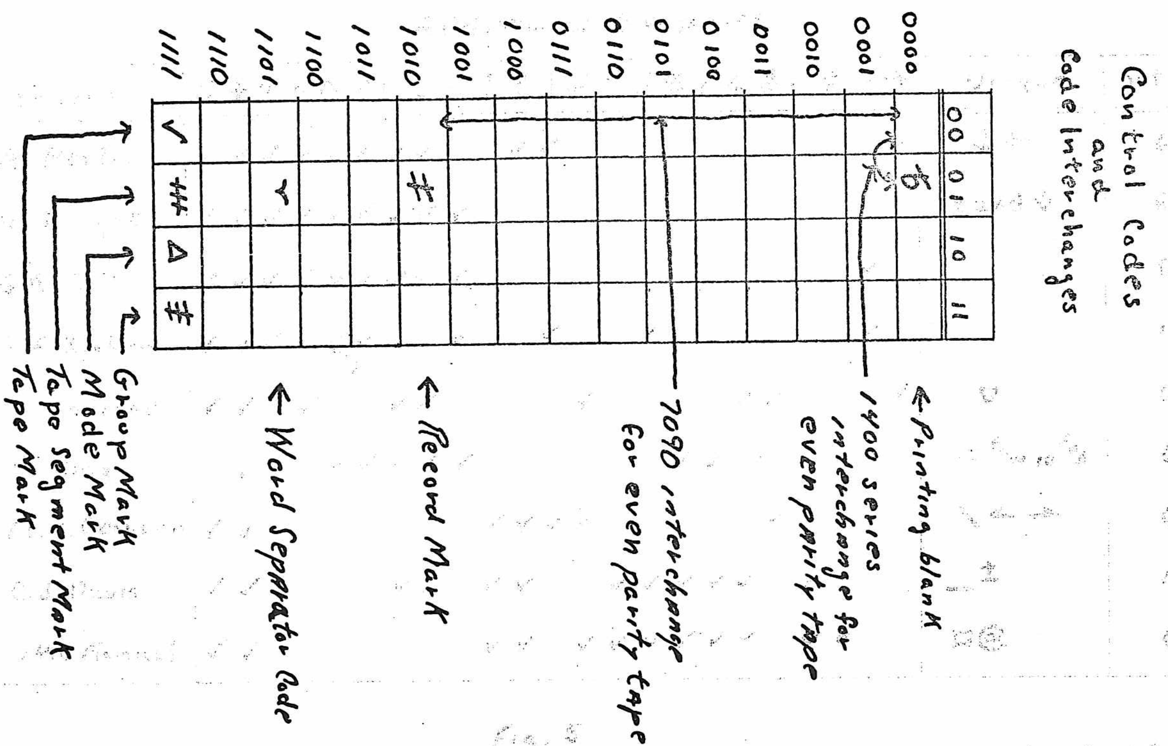


Fig. 4

F.A.W. 7/6/61

Comparison of Graphics
from
Various Standards Proposals

Common Graphics

blank 0-9 A-Z -/*,.=()' :;><

Additional Graphics

Source	$	+	↑	~	∧	∨	[	]	≡	!	?	|	#	"	%	≢	√	Δ	&	≠	¢	⊃	→	Unique	Set Size
A. Perlis	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓											✓	↓ ←	63
H. Bright	✓	✓	✓	✓	✓	✓	✓	✓	✓															eund ↓	64
G.R. Tait	✓	✓	✓	✓	✓	✓	✓	✓	✓													✓			60
G.F. Rychman	✓	✓	✓	✓	✓	✓			✓			✓			✓							✓			60
" revised	✓	✓		✓			✓	✓					✓					✓	✓				✓	∇	60
R. King		✓	✓	✓	✓	✓	✓	✓	✓							✓	✓							$:= {}^{E_o}w\,10^{E_{oR}}$	64
M.I. Bernstein	✓	✓								✓	✓	✓	✓						✓					\ ← →	60
C.J. Davis	✓	✓					✓	✓		✓	✓			✓	✓	✓	✓	✓		✓	✓			_ ±	64
1410 Manual	✓	✓								✓	✓		✓	✓	✓	✓	✓	✓		✓	✓			□@	64

Fig. 5

F.A.W. 7/6/61

Symbol Usage Study
Based on Algorithms #10 - 34 ACM Communications

Symbol	Frequency	Proposed Sets							
;	806	✓	✓	✓	✓	✓	✓	✓	✓
:=	700				✓				
,	659	✓	✓	✓	✓	✓	✓	✓	✓
[	579	✓	✓		✓		✓		
]	579	✓	✓		✓		✓		
(	334	✓	✓	✓	✓	✓	✓	✓	✓
)	334	✓	✓	✓	✓	✓	✓	✓	✓
−	266	✓	✓	✓	✓	✓	✓	✓	✓
.	217	✓	✓	✓	✓	✓	✓	✓	✓
×	173	✓	✓	✓	✓	✓	✓	✓	✓
+	155	✓	✓	✓	✓	✓	✓	✓	
:	124	✓	✓	✓	✓	✓	✓	✓	✓
=	118	✓	✓	✓	✓	✓	✓	✓	✓
/	103	✓	✓	✓	✓	✓	✓	✓	✓
<	53	✓	✓	✓	✓	✓	✓	✓	✓
>	27	✓	✓	✓	✓	✓	✓	✓	✓
≤	19								
≠	16								✓
↑	16	✓	✓	✓	✓				✓
≥	11								
÷	8								
|	8			✓		✓			✓
!	5					✓	✓	✓	✓
∨	5	✓	✓	✓	✓				
∧	2	✓	✓	✓	✓				
≡	1	✓	✓	✓	✓				
'	0	✓	✓	✓	✓	✓	✓	✓	✓
$		✓	✓	✓		✓	✓	✓	✓
¬		✓	✓	✓	✓				
?						✓	✓	✓	✓
..							✓	✓	✓
%				✓				✓	✓
#						✓		✓	✓
\						✓			
←						✓			✓

Fig. 6

FAW 6-30

THREE POSSIBLE GRAPHIC TO CODE ASSIGNMENTS

	00	01	10	11		00	01	10	11		00	01	10	11		
0000	blank	b̸	−	+&		blank	b̸	−	&		blank	b̸	−	&		
0001	1	/	J	A		1	/	J	A		1	/	J	A		
0010	2	S	K	B		2	S	K	B		2	S	K	B		
0011	3	T	L	C		3	T	L	B		3	T	L	C		
0100	4	U	M	D		4	U	M	D		4	U	M	D		
0101	5	V	N	E		5	V	N	E		5	V	N	E		
0110	6	W	O	F		6	W	O	F		6	W	O	F		
0111	7	X	P	G		7	X	P	G		7	X	P	G		
1000	8	Y	Q	H		8	Y	Q	H		8	Y	Q	H		
1001	9	Z	R	I		9	Z	R	I		9	Z	R	I		
1010	0	‡	~/!	↑/?		0	‡	~/!	\/?		0	‡	</!	>/?		
1011	=/#	,	$	.		=/#	,	$	.		=/#	,	$	.		
1100	'/@	(/%	*	)/□		'/@	(/%	*	)/□		'/@	(/%	*	)/□		
1101	:	∨	]	[		:	∨	]	[		\/_	∨	;	:		
1110	>	\/_	;	<		>	↑/"	;	<		↑/"	[	~	]		
1111	√	###	Δ	ǂ		√	###	Δ	ǂ		√	###	Δ	ǂ		←

NON PRINT

Fig. 7

7/7/61 F.A.W.

For August 1961 Issue Cancelled by phone F/C ACM [illegible] 7/12

EDITOR'S NOTE

The paper "Design of an improved transmission/data processing code" by Bemer, Smith and Williams, which appeared in this Section in the May issue, was printed under an Editor's Note which now requires updating and clarification. That Note expressed my opinion that X3.2 would "probably recommend as an American Standard a code . . . similar in principle although it may differ in some details."

First, I should like to emphasize that, as I stated, the paper had been described to me by the authors as a proposal *to* the ASA X3.2 Subcommittee; ital.
it was not presented as a proposal *by* that Subcommittee. ital.

Comments which I have received privately have not questioned the applicability and competence of the technical content of the Bemer, Smith, Williams paper; they have questioned the prudence of my expressing an early opinion on the outcome of the X3.2 deliberations. I acknowledge that criticism to be appropriate. X3.2 has met four times since my Note was written in March and has made substantial progress toward a generally-acceptable Standard while departing in some significant ways from the character set proposed by Bemer *et al*. This progress has been made as a result of reviewing, ital.
numerous contributions to the Subcommittee. The Chairman of X3.2 has informed me that they plan to publish recommendations (*by* the Subcommittee) ital.
in the near future.

AMAH 310/2

420 LEXINGTON AVENUE NEW YORK 17, NEW YORK MURRAY HILL 3-6433

DATA PROCESSING GROUP
OFFICE EQUIPMENT MANUFACTURERS INSTITUTE

JOHN H. HOWARD DIRECTOR
HERBERT S. BRIGHT ENGINEERING DIRECTOR

July 19, 1961

Mr. I. C. Liggett, Chairman
X3.2 Subcommittee
IBM Corporation
590 Madison Avenue
New York 22, N. Y.

Dear Mr. Liggett:

I should like to discuss with you and the other members of X3.2 the subject of Mr. Macon's letter to Prof. Perlis dated July 6.

Would you kindly consider having me participate in your next meeting at some time during the morning of the first day, August 2.

Yours very truly,

H. Bright

H. S. Bright
Chairman, X3

HSB:ror

Copy to X3.2 Membership

NMAH 310/2

July 26, 1961

Memorandum To ASA X3-2 Subcommittee Membership

Subject: August X3-2 Agenda

A clarification is in order on Item 4, Discussion of Letter to Dr. Alan J. Perlis.

The letter sent to Dr. Perlis from the committee was timed such that it was not certain that it would appear in the August issue. Mr. Bright had previously submitted a correcting editor's note about ten days prior to the receipt of the X3-2 letter. It was felt that Mr. Bright's comments and the committee's comments should be coordinated to avoid any further damaging publicity for the committee. On this basis and the possibility that our X3-2 letter would not be published in the August issue, we agreed to withdraw Mr. Bright's communication. A statement will be published in the next issue. This was agreed by discussion with Mr. Bright, Mr. Macon and me.

I am hopeful that this matter can be resolved in a brief period on August 2 to the committee's and Mr. Bright's satisfaction.

I C Liggett

I. C. Liggett, Chairman
ASA X3-2 Subcommittee

ICL:vmg
Attachment

NMAH 310/2

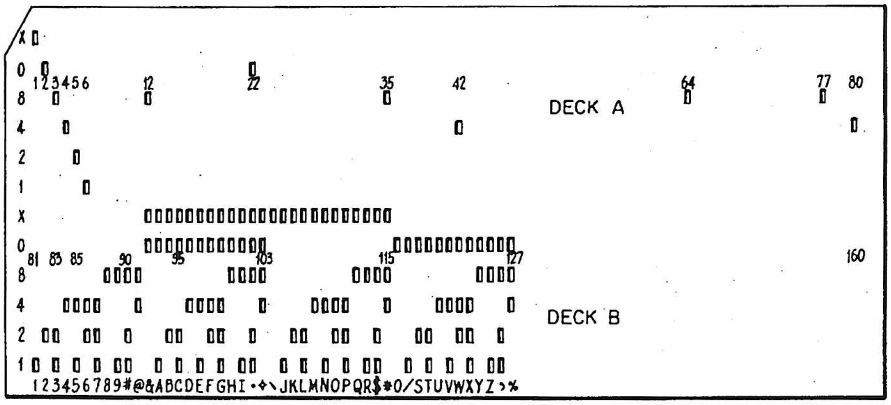
Horace

Aug. 1, 1961 H. S. BEATTIE **2,994,475**

CARD FEEDING, SENSING, AND TRANSLATING MECHANISM

Filed April 8, 1955 19 Sheets-Sheet 16

FIG. 13



NUMERICAL PUNCH	WITHOUT A ZONE PUNCH	WITH X & O PUNCH	WITH X PUNCH	WITH O PUNCH
NONE	*	&	\	0
1	1	A	J	/
2	2	B	K	S
2-1	3	C	L	T
4	4	D	M	U
4-1	5	E	N	V
4-2	6	F	O	W
4-2-1	7	G	P	X
8	8	H	Q	Y
8-1	9	I	R	Z
8-2-1	#	•	$	,
8-4	@	◇	*	%

FIG. 14

INVENTOR
HORACE S. BEATTIE
BY Joseph C. Taphorn
ATTORNEY

Subcommittee X3-2 - Character Sets and Data Formats of ASA X3 Sectional Committee on Data Processing Standards

MINUTES

Ninth Meeting, August 2nd, 3rd and 4th, 1961
ASA Headquarters, New York, N. Y.

SUMMARY

The draft report on the ASA X3-2 - Government Meeting was reviewed. Mr. Whitman was appointed liaison man with X3-5. The situation surrounding one paper and editors note which appeared in the May ACM was reviewed and appropriate letters prepared. Task groups were formed to carry out the objectives of X3-2 with respect to each of the principle media. Control code requirements were discussed. The work of the committee with respect to code design was reviewed and the nature of the code to be recommended as a standard was discussed at some length.

NMAH
310/2

August 31, 1961

X3-2 Sub-Committee
on
Character Sets & Data Formats
of the
American Standards Association
X3 Sectional Committee
Sponsored by
B.E.M.A.

MINUTES

MEETING OF AUGUST 2, 3 AND 4th

1. MEMBERSHIP & ATTENDANCE

1.1

Member	Corporation	August 2	3	4	Alternate	August 2	3	4
John Auwaerter	Teletype Corp.	x	x	x				
Leon Bloom	NCR	x	x	x				
T. H. Bonn	Remington Rand	x			D. Utman	x	x	x
L. L. Griffin	Navy Department	x	x	x				
R. Gryb	AT&T Company				J. Booth	x	x	x
H. Kleinberg	RCA				Spielman	x	x	
I. C. Liggett	IBM	x	x					
W. J. Luebbert								
C. E. Macon	Burroughs Corp.	x	x	x				
R. W. Reach	Minneapolis Honeywell							
H. J. Smith, Jr.	IBM	x	x	x				
H. Tholstrup	Friden Inc.							
Allen L. Whitman	Bell Tele Lab.	x	x	x				

1.2 Observers & Guests

J. Howard

H. Bright

. DOCUMENTS DISTRIBUTED

The following documents were submitted:

2.1 Processor Control Characters

2.2 8-bit Set Processor Oriented - by H. J. Smith

2.3 8-bit Set - by H. J. Smith

2.4 The letter from J. McGregor Ross of Ferranti with an attachment extract from Automatic Program Information covering AGOL and COBOL.

2.5 Error Detection System for 5 Unit Code Teletype-writer Transmission.

3. X3-2 GOVERNMENT MEETING

The Secretary reported that papers were required from Mr. Booth, Major Luebbert and Mr. Auwaerter before the final report on the ASA X3-2 - Government meeting can be completed and circulated. Major Luebbert will mail his paper to the Chairman within the next few days and the remaining two papers are to be completed by 8/15/61. The "Notes on Joint ASA X3-2 - Government Meeting" appended to the Minutes of the June 30 meeting were approved for inclusion with the final report with the following additions under section 3.1:

3.1.4 The increasing interchange of information between civil and military data processing activities on a day-to-day basis.

3.1.5 The increasing interchange of information between civil and military communication systems on a day-to-day basis.

These "Notes" plus the papers prepared and submitted by the speakers will constitute the final report on the meeting which will be distributed to those Government representatives present at the meeting who requested copies of the information and to X3-2 members.

4. The Chairman reported on the B.E.M.A. News Bulletin and a copy was circulated. The Secretary was directed to request that the members of X3-2 be placed on the regular mailing list for this publication.

. The subject of liaison with X3-5, Sub-Committee on "Definition of Data Processing Operations and Terminology and Glossary", was discussed. Mr. Allen Whitman was appointed as the liaison man with this sub-committee by unanimous vote. Mr. Whitman circulated a tentative list of terms and their definitions related to X3-2 activities which he had prepared. The members of X3-2 were advised to supply Mr. Whitman with any assistance or remarks which he may require to fulfill his responsibilities as liaison officer.

6. Mr. Bright reported to the Committee that a new ASA Sectional Committee was in the process of formation. This sectional committee is to be known as X6 and will be concerned primarily with the numerically controlled machine tool industry. It is believed this committee will be sponsored by EIA. Apparently their work may encompass the input/output media for data processors and hence may overlap the activities of X3-2 to a certain extent. Meetings between X3 & X6 representatives are planned to discuss this problem.

7. Mr. Bright brought before the Committee the subject of the article which appeared in the May issue of the ACM "Design of an Improved Transmission/Data Processing Code" and the editor's note which accompanied this paper. The letter which was sent to Dr. Perlis was discussed at some length and was reworded. Mr. Bright pointed out that the letter directed to the Editor-in-Chief implied personal criticism of the Standards Editor. As a result, a revised letter was directed to the Standards Editor of ACM. Mr. Bright is the Standards Editor of ACM as well as Chairman of X3. Mr. John Howard was present during portions of these discussions. Attached are copies of the correspondence.

8. The formation of the task groups to carry on the work of X3-2 with regard to each of the media was discussed. The aim of these task groups would be to apply the recommended standard coded character set to each of the media and in addition to recommend standards on the physical parameters of the medium and the data format to be employed.

The following Task Groups were established:

X3-2.1 Magnetic Tape

X3-2.2 Punched Paper Tape

X3-2.3 Punched Cards

Membership will be governed by the same rules as currently apply to X3-2. The initial assignment of each Task Group will be to survey the work which has been done in their particular area and present a summary to X3-2. Pro tem Chairmen were elected to head each of the Task Groups. These are: Ted Bonn - Chairman of X3-2.1, John Auwaerter - Chairman of X3-2.2 and L. L. Griffin - Chairman of X3-2.3. To establish the initial membership, each member of X3-2 was asked to recommend to the Task Group Chairman a representative from their organization. Membership from organizations not represented on X3-2 will be solicited.

9. CONTROL CODES

9.1 Communication Needs

Mr. Whitman presented the results of studies carried out by Mr. Auwaerter, Mr. Booth and himself. The following controls were discussed.

Required	Desired	"Nice If"
Upper Case	Stop	Are You?
Lower Case	End of Address	Page Backspace
Carriage Return	End of Tape	Tape Backspace
Line Feed	Start of Message	Reverse Line Feed
Horz. Tab	Printer On	Record Data On
Vertical Tab	Printer Off	Record Data Off
Feed Out	Punch On	Break
Bell	Punch Off	Set Tab
WRU	Reader On	Clear Tab
End of Message	Reader Off	Color Shift
Answer Back		

9.2 Data Processing Needs

In addition to the controls outlined above, a few of which would be required by data processing, the controls are outlined in the Note distributed. Basically the null, idle and escape functions are required and would be shared with communications. In addition, the 8 data delimiters are required.

10. The work of the Committee was reviewed to date with respect to recommendations for a standard. The conflicting requirements were discussed in some length and the areas of compromise were again reviewed. Messrs. Auwaerter, Bloom and Macon were assigned as an ad hoc Committee to generate, by the next meeting, a format for the final report on the code. It is hoped that at the next meeting the coded character set which is to be recommended can be established and that documentation can be initiated for the final submission.

The effect of noise on transmission systems was discussed and Mr. Booth will prepare a more detailed report on the subject for the next meeting.

There was considerable discussion on whether 7 level or 8 level code should be recommended as a standard. The general conclusion was that if a recommendation were to be submitted in the near future, it would have to be a 7 level code. The design of an 8 level will involve considerable extended time period and a great deal of effort.

11. The next meeting will be held on September 14 and 15 at the B.E.M.A. headquarters in New York City. The first day will commence at 9:30 A.M. Since this meeting will be of paramount importance to the X3-2 activities, all members are strongly urged to attend. The B.E.M.A. address is:

235 East 42nd Street
New York, New York

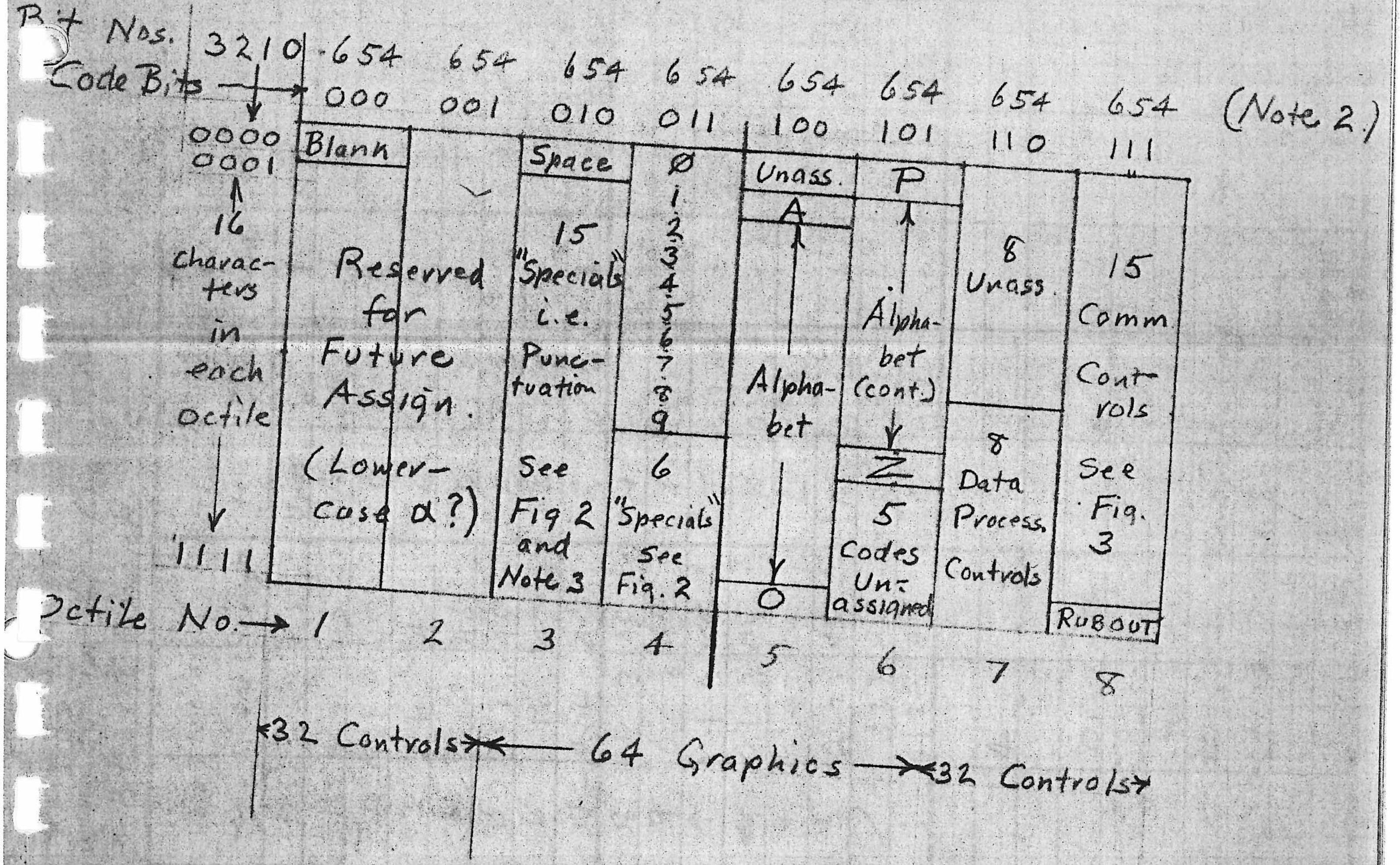
Telephone: MUrrayhill 5-7969

C E Macon
C. E. Macon
Secretary

CEM/ea

J.F. Auwaerter

Basic Structure for 7-Bit Code (Note 1)
As Proposed by X3-2 Subcommittee
for
Combined Communications & Data Processing



Notes:

1. 7 information bits, numbered 0 through 6, plus Bit No. 7 reserved for possible parity, plus 1 start bit and 2-bit Stop element, give 11 bits per character.
2. Serial order of transmission 0 through 7.
3. Desired Collating Sequence in Octile 3:
   Space . & * - / ,

AMAL 310/2

Fig. 1

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Fig. 2

Revised Code Assignments in ~~64~~ Character Graphic Set
Octiles 3-6 of 7-Bit 128-Character Set — See Note 1

	Character	Marking Code Elements		Character	Marking Code Elements		Character	Marking Code Elements		Character	Marking Code Elements	
	Space		5	0		45	Unass.		6	P		4 6
	!	0	5	1	0	45	A	0	6	Q	0	4 6
	*	1	5	2	1	45	B	1	6	R	1	4 6
	#	01	5	3	01	45	C	01	6	S	01	4 6
	$	2	5	4	2	45	D	2	6	T	2	4 6
	%	0 2	5	5	0 2	45	E	0 2	6	U	0 2	4 6
	=	12	5	6	12	45	F	12	6	V	12	4 6
	&	012	5	7	012	45	G	012	6	W	012	4 6
	(	3	5	8	3	45	H	3	6	X	3	4 6
	)	0 3	5	9	0 3	45	I	0 3	6	Y	0 3	4 6
	.	1 3	5	↑	1 3	45	J	1 3	6	Z	1 3	4 6
	,	01 3	5	←	01 3	45	K	01 3	6	Unass	01 3	4 6
	—	23	5	+	23	45	L	23	6	Unass	23	4 6
	"	0 23	5	'	0 23	45	M	0 23	6	Unass	0 23	4 6
	?	123	5	/	123	45	N	123	6	Unass	123	4 6
	:	0123	5	;	0123	45	O	0123	6	Unass	0123	4 6
Octile		3			4			5			6	
Bit Nos of Binary Code →	B	0123	456		0123	456		0123	456		0123	456

Note 1: See Table 4 for associated control codes with 32 potential characters in octiles 7 and 8

Fig. 2

AUG 12 1961

Revised Control Code Assignments in 32-Character Control Set
Octiles 7 and 8 of 7-Bit 128-Character Set - See also Table 3

Character	Marking Code Elements		Character	Marking Code Elements	
Unass		56*	Feedout		456*
Unass	0	56	Stop	0	456
Unass	1	56	UC	1	456
Unass	01	56	LC	01	456
Unass	2	56	WRU	2	456
Unass	0 2	56	EOA	0 2	456
Unass	12	56	EOM	12	456
Unass	012	56	EOT	012	456
↑	3	56	Ansback	3	456*
	0 3	56	H Tab	0 3	456
	1 3	56	V Tab	1 3	456
Note	01 3	56	CR	01 3	456
1	23	56	Bell	23	456*
	023	56	LF	023	456
	123	56	Stunt	123	456*
↓	0123	56	Rubout	0123	456*
Octile 7			8		(Note 2)

Explanation of Symbols

Feedout = Page or Form out
UC = Upper Case
LC = Lower Case
WRU = Who Are You
EOA = End of Address
EOM = End of Message
EOT = End of Transmission
H Tab = Horizontal Tab
V Tab = Vertical Tab
CR = Carriage Return
LF = Line Feed

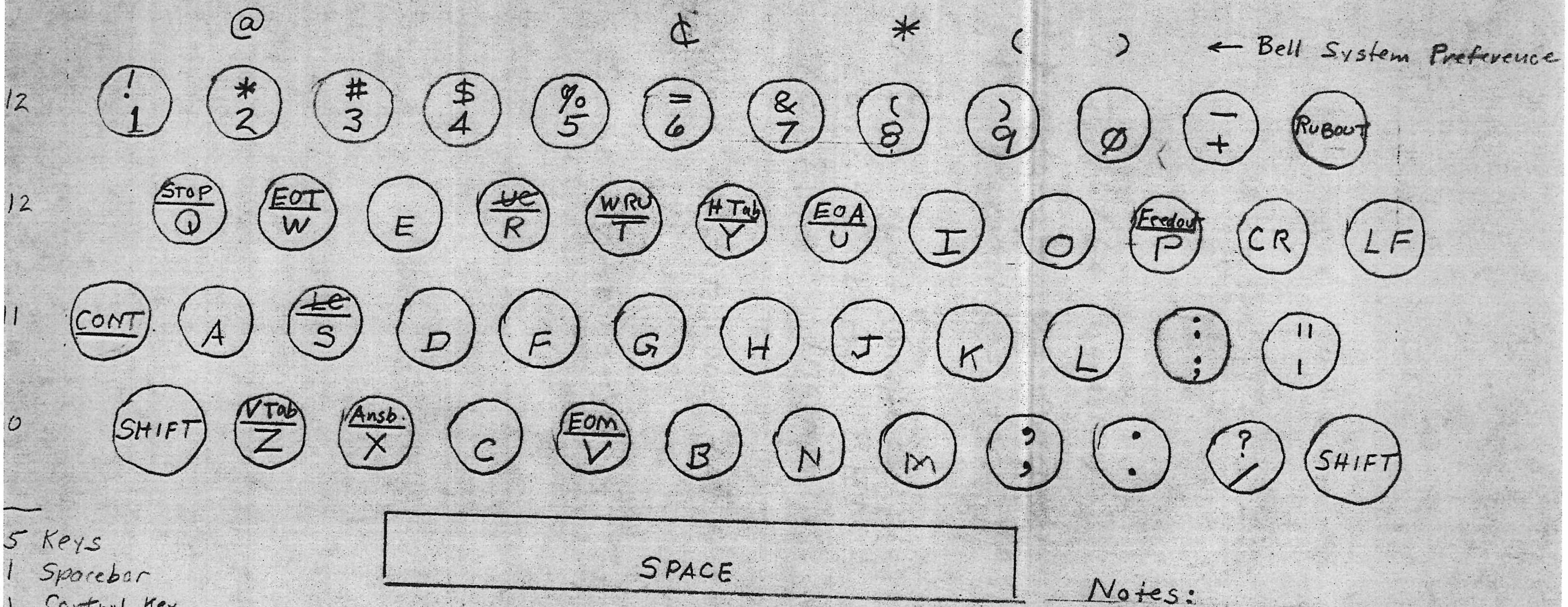
Note 1: These 8 characters reserved for Data Processing controls, such as block delimiters

Note 2: Characters in Octiles 1 and 2 are not assigned. A possible use for part of them is the lower case alphabet

* "Hit" characters, which can be generated by a single timed space.

Fig 3

AUG 14 1961



5 Keys
1 Spacebar
1 Control key
2 Shift keys

KEYBOARD LAYOUT BASED ON
X3-2 Subcommittee
7-Bit Code of August 4, 1961

Fig. 4

Notes:

1. Depression of SHIFT key changes Bit No. 4 from Mark to Space for upper keytop symbols not underlined
2. Depression of CONT key changes Bit No. 5 from Space to Mark for upper Keytop symbols Underlined.

ALW 8-14-61

SOME POSSIBLE BELL SYSTEM CHOICES FOR NEW TELETYPEWRITER & DATA CODE FOR 4-ROW KEYBOARD OPERATION

1. 6-Bit (64 character) CODE - (modified Fieldata) as currently used in 4-row machines for 1961-62 Trial

2. 7-Bit (64 Graphics plus Controls) as currently before BEMA Subcommittee X3-2. Incompatible with Fieldata

3. New 7-Bit code optimized for Bell System

4. Some combination of the above

Fig. 5

ALW
61

SUGGESTED BELL SYSTEM OFFERINGS for 4-ROW KEYBOARD OPERATION

Type Arrangement	Info. Bits (See Note 1)	Description	Application
E	6	Modified Fieldata	Typewriter Message - TWX & WADS
F	6	Weather	Weather Nets - like present Type D
G	7	X3-2	Data Processing - From keyboard, via tape, to computer without translation - WADS, not TWX

Note 1: For all cases, line transmission will be by an 8-bit code plus 1 Start and 2 Stop bits, total 11 bits per character, at a rate of 110 bauds, 100 WPM. All machines will accept but disregard unused bits

Fig. 6

ALW
-14-61

August 15, 1961

Dr. Alan J. Perlis
Editor-in-Chief
ACM Communications

Dear Sir:

On July 6, 1961 a letter was addressed to you from ASA X3-2 on the subject of a paper entitled "Design of an Improved Transmission/Data Processing Code" by Bemer, Smith and Williams and a note by the Standards Editor which appeared in the May, 1961 issue of the Communications of the ACM. Subsequently Mr. Bright, Standards Editor for ACM and Chairman of X3, contacted the chairman and secretary of X3-2 requesting that he be permitted to discuss this matter with the X3-2 at the next regular meeting (August 2nd and 3rd). In the interim, no reference to the subject matter was to appear in the ACM.

Accordingly, Mr. Bright was present during those portions of the meeting devoted to this issue. The letter was reworded. Mr. Bright pointed out that a letter addressed to the Editor-in-Chief would imply personal criticism of the Standards Editor, a policy with which X3-2 was not familiar. The revised letter was addressed to the Standards Editor. It is our understanding that this letter will appear in the September issue of Communications of the A.C.M.

In view of the above, would you please disregard the original letter addressed to you.

Best regards,

C E Macon

C. E. Macon
Secretary ASA X3-2

CEM:aks

Copy: H. S. Bright
Standards Editor
420 Lexington Avenue
New York 17, N. Y.

am AH 310/2

I. OBJECTIVE

A single code for the interchange of data between communication systems and data processing systems without translation.

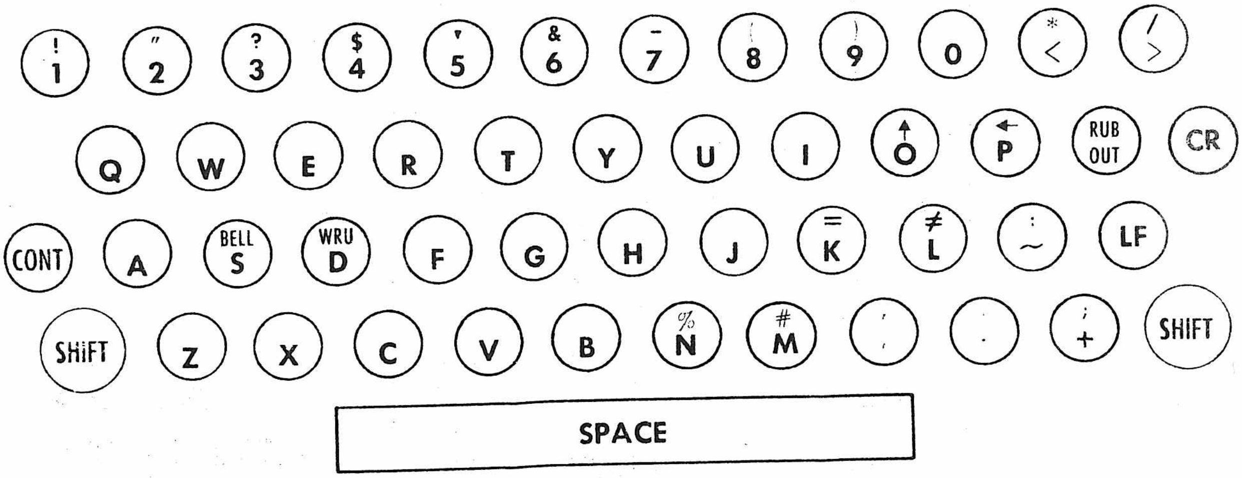
II. FACTORS TO BE CONSIDERED IN ACHIEVING OBJECTIVE

1. Existing equipment and systems
    a. Fieldata MIL-STD-188A
2. Code requirements to optimize equipment and systems within a given area.
    a. Communicators
        1) Keyboard
        2) Printing mechanism
        3) All 0's (Blank)
        4) All 1's (Rubout)
    b. Data processors
        1) Collating
        2) Grouping by characteristics
        3) Dense binary set
        4) Expansion and contraction

NM Att
3/0/2

Bemer cites
between
Sep 12
& Sep 14
1961

III. COMPROMISES TO ACHIEVE OBJECTIVES



KEYBOARD ARRANGEMENT
BASED ON
PROPOSED X3.2 CODE

Jun 7-8
1961

Aug 24 1961
filed in
mine before
Oct 4 1961

COMPROMISES

	LOGICAL		IBM		WASH.		L.A.		NCR		PRESENT BELL	
0000	ƀ	0	ƀ	0	ƀ	0	ƀ	0	ƀ	0	)	0
0001	•	│	'	│	!	│	'	│	'	│	!	1
0010	,	│	"	│	"	│	"	│	"	│	🔔	2
0011	:	│	&	│	?	│	$	│	#	│	#	3
0100	;	│	$	│	$	│	%	│	$	│	$	4
0101	?	│	%	│	'	│	&	│	%	│	%	5
0110	(	│	*	│	&	│	*	│	@	│	✠	6
0111	)	│	–	│	–	│	–	│	&	│	&	7
1000	"	│	(	│	(	│	(	│	(	│	*	8
1001	'	9	)	9	)	9	)	9	)	9	(	9
1010	+	&	:	χ	;	+	:	χ	–	*	"	'
1011	–	%	;	+	:	C_R	;	+	?	/	:	;
1100	χ	#	?	C_R	*	←	?	/	:	+	?	/
1101	/	$	/	#	/	→	#	C_R	;	C_R	–	_
1110	↑	*	,	↑	,	χ	,	↑	,	↑	,	ESC.
1111	←	@	•	←	•	|	•	←	•	←	•	Del.

	LOGICAL	IBM	WASH.	L.A.	NCR	PRESENT BELL
4 BIT SET	GOOD	FAIR	GOOD	EXC.	EXC.	BAD
HIST. COLLATE • & ✱ – / ,	BAD	GOOD	FAIR	FAIR +	BAD	FAIR
COLLATE OK SDAZ OR SAZD	FAIR	EXC.	EXC.	FAIR	POOR	BAD
TYPEWRITER NO. & SYMB.	BAD	FAIR	POOR	FAIR +	GOOD	EXC.
TYPEWRITER DUAL SYMB.	BAD	POOR	BAD	FAIR +	FAIR	EXC.
GROUPING	EXC.	GOOD	FAIR	GOOD	FAIR	BAD